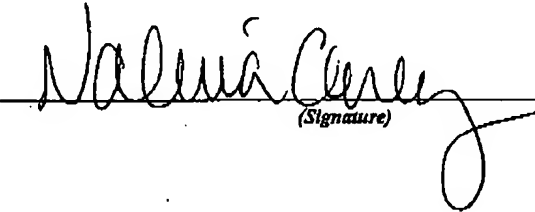


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No. 1703 P. 1

CERTIFICATE OF TRANSMISSION BY FACSIMILE (37 CFR 1.8) Applicant(s): Leonard R. Kilby, et al.			Docket No. 79123-1131
Application No. 10/670,113	Filing Date 9/24/03	Examiner Sameh Tawfik	Group Art Unit 3721
Invention: PATTERN FORMER AND METHOD OF PATTERN FORMING FOR WRAPPED BAKERY PRODUCTS			
<p>I hereby certify that this <u>Resp. to Notif. of Non-Compliant Appeal Brief& Third Amended Brief for Appellants</u> (Identify type of correspondence) is being facsimile transmitted to the United States Patent and Trademark Office (Fax. No. <u>1-571-273-8300</u>) on <u>11-21-06</u> (Date)</p> <p style="text-align: right;"><u>Valeria Carey</u> (Typed or Printed Name of Person Signing Certificate)</p> <p style="text-align: right;"> (Signature)</p> <p style="text-align: center;">Note: Each paper must have its own certificate of mailing.</p>			

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No. 1703 P. 2

TRANSMITTAL LETTER
(General - Patent Pending)

Docket No.
79123-1131

In Re Application Of: **Leonard R. Kilby, et al.**

Application No.	Filing Date	Examiner	Customer No.	Group Art Unit	Confirmation No.
10/670,113	9/24/03	Sameh Tawfik	38406	3721	8154

Title: **PATTERN FORMER AND METHOD OF PATTERN FORMING FOR WRAPPED BAKERY PRODUCTS**

COMMISSIONER FOR PATENTS:

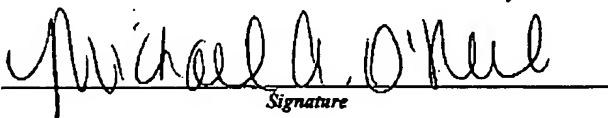
Transmitted herewith is:

**Response to Notification of Non-Compliant Appeal Brief; and
Third Amended Brief for Appellants**

in the above identified application.

- ☒ No additional fee is required.
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Dated: November 21, 2006

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	§	
	§	
LEONARD R. KILBY, et al.	§	
	§	
Serial No. 10/670,113	§	BEFORE THE BOARD OF
	§	PATENT APPEALS AND
Filed: September 24, 2003	§	INTERFERENCES
	§	
For: Pattern Former and Method of	§	
Pattern Forming for Wrapped	§	
Bakery Products	§	
	§	
Examiner: Sameh Tawfik	§	
	§	
Art Unit 3721	§	
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Commissioner for Patents		
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Sir:

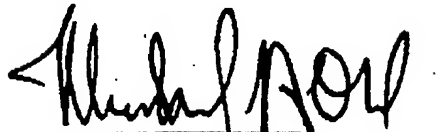
RESPONSE TO NOTIFICATION OF NON-COMPLIANT APPEAL BRIEF

Applicant hereby responds to the Notification of Non-Compliant Appeal Brief dated November 8, 2006.

Responsive to paragraphs 2 and 10 of the Notification, applicant herewith submits a Third Amended Brief for Appellants wherein all non-compliant issues have been corrected.

Respectfully submitted,

MICHAEL A. O'NEIL, P.C.

A handwritten signature in black ink, appearing to read "Michael A. O'Neil", written over a horizontal line.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	§	
	§	
LEONARD R. KILBY, et al.	§	
	§	
Serial No. 10/670,113	§	BEFORE THE BOARD OF
	§	PATENT APPEALS AND
Filed: September 24, 2003	§	INTERFERENCES
	§	
For: Pattern Former and Method of	§	
Pattern Forming for Wrapped	§	
Bakery Products	§	
	§	
Examiner: Sameh Tawfik	§	
	§	
Art Unit 3721	§	

THIRD AMENDED BRIEF FOR APPELLANTSTABLE OF CONTENTS

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STATUS OF AMENDMENTS

No amendment was filed subsequent to the final rejection. However, a Terminal Disclaimer has been filed in response to the Examiner's nonstatutory double patenting rejection of Claims 63 and 64.

SUMMARY OF CLAIMED SUBJECT MATTER

The Application contains two independent claims—Claim 63 and Claim 64—which are both method claims comprising methods of assembling or forming wrapped bakery products into patterns and transferring the patterns into bakery trays for transport. Specifically, Claim 63 includes the steps of providing a grouping apparatus for receiving individual wrapped bakery products and on which groups of between 1 and about 6 wrapped bakery products are arranged [Page 14, lines 14-22; Figures #1, #2]; providing a turntable onto which the wrapped bakery products are moved from the grouping apparatus via a transfer apparatus [Page 14, lines 23-26; Figures #1, #2]; and *arranging a subsequent group of wrapped bakery products on the grouping apparatus during movement of a previous group from the grouping apparatus to the turntable* [Page 15, lines 1-11].

Claim 64 includes the steps of providing a turntable on which a pattern of wrapped bakery products are formed [Page 15, lines 13-15; Figure #3]; moving the patterns of wrapped bakery products *directly* from the turntable into bakery trays under the action of a transfer apparatus [Page 15, lines 15-19; Page 21, lines 1-27; Figures #12, #63]; and *forming a subsequent pattern of wrapped bakery products on the turntable during movement of a previous pattern into a bakery tray* [Page 15, lines 1-11].

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GROUND OF REJECTION TO BE REVIEWED ON APPEAL

The Examiner rejected both Claim 63 and 64 under 35 U.S.C. § 102(b), but cited a different prior art reference to support each rejection. The basis for Applicant's response to each rejection is different, i.e., each prior art reference is missing a different element of the claim for which it is the basis of the Examiner's rejection. Thus, Applicant respectfully submits that both Claim 63 and 64 cannot stand or fall together in this Appeal, but rather must be examined separately.

ARGUMENT

1) It is submitted that the Examiner was correct in rejecting Claims 63 and 64 under the doctrine of nonstatutory double patenting, and therefore Applicant has filed a Terminal Disclaimer of Claims 63 and 64 concurrently herewith.

2) It is submitted that the Examiner improperly rejected Claims 63 and 64 on the basis of anticipation under 35 U.S.C. § 102(b) because the cited prior art references (U.S. Patent No. 4,522,292, to Euverard et al. ("Euverard"), and U.S. Patent No. 5,317,859, to Schneider et al. ("Schneider")) do not disclose all of the requisite steps of Claims 63 and 64. In particular, Euverard does not disclose the step of "arranging a subsequent group of wrapped bakery products on the grouping apparatus during movement of a previous group of wrapped bakery products from the grouping apparatus onto the turntable under the action of the transfer apparatus." And Schneider does not disclose the steps of "moving patterns of wrapped bakery products directly from the turntable into bakery trays under the action of the transfer apparatus; and forming a subsequent pattern of wrapped bakery products on the turntable during movement of a previous pattern of wrapped bakery products into a bakery tray under the action of the transfer apparatus."

I. EUVERARD DOES NOT DISCLOSE THE STEP OF ARRANGING A SUBSEQUENT GROUP OF WRAPPED BAKERY PRODUCTS ON THE GROUPING APPARATUS DURING MOVEMENT OF A PREVIOUS GROUP OF WRAPPED BAKERY PRODUCTS FROM THE GROUPING APPARATUS ONTO THE TURNABLE UNDER THE ACTION OF THE TRANSFER APPARATUS

A claim can only be anticipated by a prior art reference under 35 U.S.C. § 102(b) if the prior art reference expressly or inherently discloses each and every step of the method. See MPEP 2131.01; *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987). Euverard simply does not disclose each and every step of the method of Claim 63.

First, it is submitted that the Examiner impermissibly focuses the rejection on the structure of Claim 63 instead of the function. It appears that the Examiner makes two arguments in the Final Office Action in rejecting Claim 63. First, the Examiner states on page 3 of the Final Office Action that the infeed conveyor 21 and grouping gate 27 of Euverard disclose the grouping apparatus of Claim 63. The Examiner goes on to state that the endless conveyor belt 25 of the infeed conveyor 21 discloses the transfer apparatus of Claim 63. But the Examiner takes an inconsistent position on page 5 of the Final Office Action stating that the grouping gate 27 of Euverard alone discloses the grouping apparatus and that the infeed conveyor 21 discloses the transfer apparatus. It is respectfully submitted that neither argument supports the rejection of Claim 63, and that the rejection should therefore be reversed.

In regard to the Examiner's first argument, it is clear that the infeed conveyor 21 (with its bed 22, roller 24, and endless conveyor belt 25) cannot perform both the step of "providing a grouping apparatus for receiving individual wrapped bakery products" and the step of "providing a transfer apparatus for moving groups of wrapped bakery products from the grouping apparatus onto the turntable" as required by Claim 63. The use of the transfer apparatus of the present

invention comprises an important improvement over the disclosure of the prior art. By means of the transfer apparatus it is possible to accumulate a subsequent group of wrapped bakery products on a grouping apparatus *while the previous grouping of wrapped bakery products is being transferred into the turntable*. This is not disclosed in Euverard because there the same device, i.e., the infeed conveyor 21, is used to group bakery products and to transfer them onto the turntable. Thus, Euverard does not disclose each and every step of Claim 63 and cannot anticipate the same.

It appears that the Examiner recognizes this problem and thus makes the second argument on page 5 of the Final Office Action. However, it is respectfully submitted that the Examiner's suggestion that the grouping gate 27 of Euverard alone can be used in the step of "providing a grouping apparatus for receiving individual wrapped bakery products" in Claim 63 also fails. First, Claim 63 includes the step of "arranging groups of between 1 and about 6 wrapped bakery products *on the grouping apparatus*" (emphasis added). In Euverard the wrapped bakery products are not arranged *on* the grouping gate 27, but rather are lined up on the endless conveyor belt 25 *behind* the grouping gate 27. Second, in Euverard between 1 and about 6 wrapped bakery products are not *arranged* behind the grouping gate 27, but rather the grouping gate 27 simply holds the line of bakery products on the conveyor belt 25 while the desired number of bakery products are arranged *between* the grouping gate 27 and another gate 68 on the conveyor belt 25. See Figure 1 of Euverard. So again, the endless conveyor belt 25 is part of the grouping apparatus of Euverard, and cannot also disclose the steps employing the transfer apparatus of Claim 63. Thus, Euverard does not disclose arranging the products on a grouping apparatus and then moving the products onto the turntable with a separate transfer apparatus, and therefore Euverard does not anticipate Claim 63.

II. SCHNEIDER DOES NOT DISCLOSE MOVING PATTERNS OF WRAPPED BAKERY PRODUCTS DIRECTLY FROM THE TURNTABLE INTO BAKERY TRAYS

In the Final Office Action the Examiner states that Schneider discloses the step of moving patterns of wrapped bakery products directly from the turntable into bakery trays under the action of the transfer apparatus, and bases this assertion on Figures 4A-4C of Schneider. However, more instructive is Figure 1 of the method disclosed by Schneider.

Claim 64 of the application requires that patterns of bakery products be moved *directly* from the turntable into bakery trays. In other words, there is no step or device between the turntable and the bakery trays in the claimed invention. Figures 2 and 3 of the Application illustrate that in this step the movement is in-line from the turntable to the bakery trays. This is an important improvement over the prior art, and simply is not disclosed in Schneider.

Figure 1 of Schneider is a top view of the Schneider device, as opposed to Figures 4A-4C relied on by the Examiner, which are side views, and shows that bakery products are moved from the turntable assembly 70 to the transfer conveyor assembly 80, then *laterally* over to the loader assembly 110 via the pusher assembly 90, and then finally into the bakery trays. In other words, there are two steps between the turntable and the bakery trays in Schneider, and the products travel laterally in Schneider wherein the products travel only longitudinally in the claimed invention. Thus, it is respectfully submitted that Schneider does not disclose the element of "moving patterns of wrapped bakery products directly from the turntable into bakery trays under the action of the transfer apparatus," and therefore does not anticipate Claim 64.

Furthermore, Schneider does not disclose the step of forming a pattern of wrapped bakery products on the turntable. Instead, the pattern is formed in Schneider on the transfer conveyor assembly 80. And even if forming the pattern on the transfer conveyor assembly is construed as

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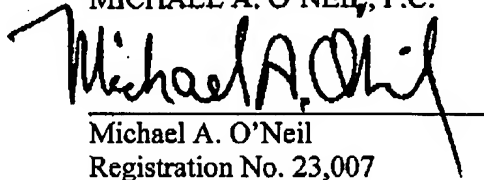
equivalent to forming the pattern on the turntable (which the Applicant expressly denies), Schneider does not disclose the step of forming a *subsequent* pattern of wrapped bakery products on the turntable during movement of a *previous* pattern of wrapped bakery products into a bakery tray under the action of the transfer apparatus. The transfer conveyor assembly cannot handle two patterns simultaneously as can the turntable in the claimed invention, and thus Schneider does not disclose this step of Claim 64 and cannot anticipate the same.

III. CONCLUSION

The Examiner's 35 U.S.C. § 102(b) rejection of Claims 63 and 64 of the Application are fatally flawed because neither the Euvard nor the Schneider reference discloses each and every step of the methods of the rejected claims.

Respectfully submitted,

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United States Patent [19]

Euverard et al.

[11] Patent Number: **4,522,292**[45] Date of Patent: **Jun. 11, 1985**[54] **PATTERN FORMING APPARATUS AND PRODUCT ORIENTER THEREFOR**

[75] Inventors: Maynard R. Euverard, Williamsburg, Va.; James J. Diver, South Holland; Thomas C. Schnelder, Oak Forest, both of Ill.

[73] Assignee: Velten & Pulver, Inc., Chicago Ridge, Ill.

[21] Appl. No.: 457,431

[22] Filed: Jan. 12, 1983

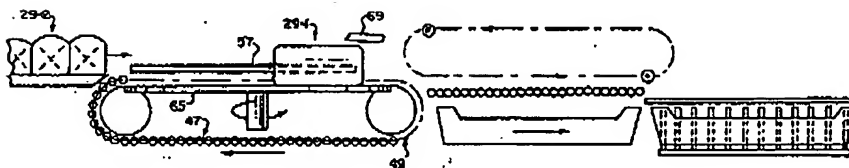
[51] Int. Cl.³ B65G 47/24

[52] U.S. Cl. 198/374; 198/339; 198/434; 414/67

[58] Field of Search 198/374, 413, 414, 434, 198/779; 414/67, 62; 53/544, 446; 198/379, 411, 394, 339, 344

[36] **References Cited****U.S. PATENT DOCUMENTS**1,914,806 6/1933 Hormel 198/379
2,985,322 5/1961 Parker 414/674,176,741 12/1979 Vogel 198/779
4,205,742 6/1980 Thomas et al. 198/374
4,352,616 10/1982 Brenner 198/374*Primary Examiner*—Joseph E. Valenza
Attorney, Agent, or Firm—Emrich & Dithmar[57] **ABSTRACT**

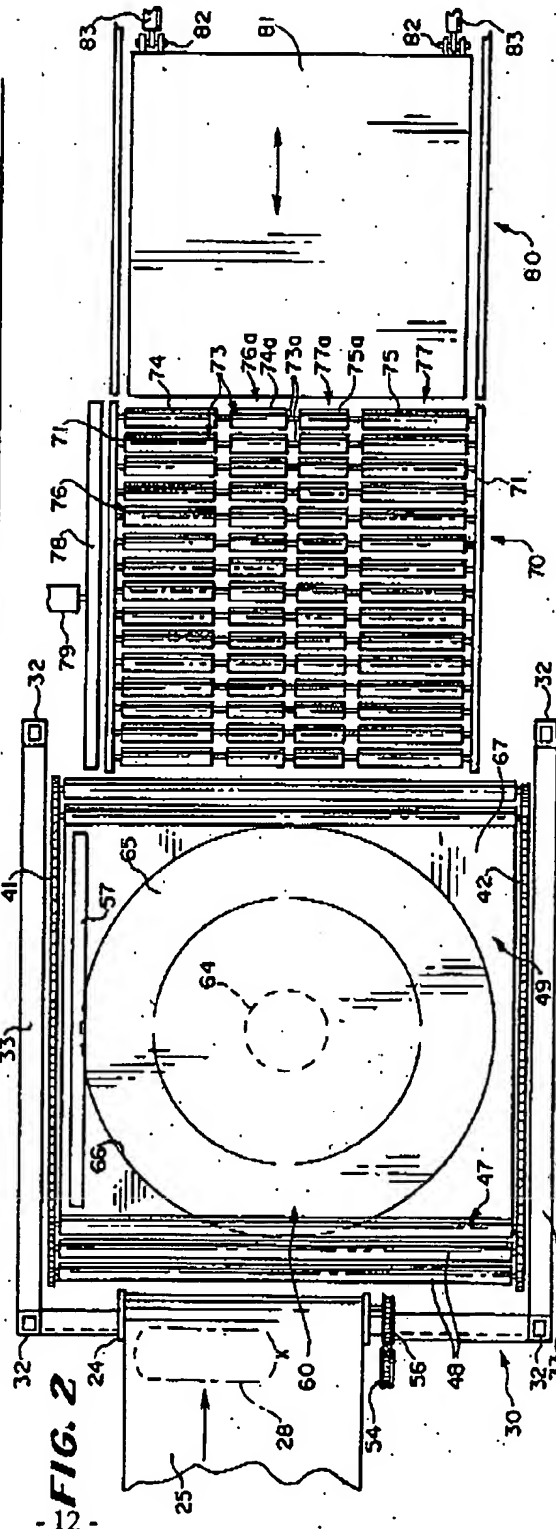
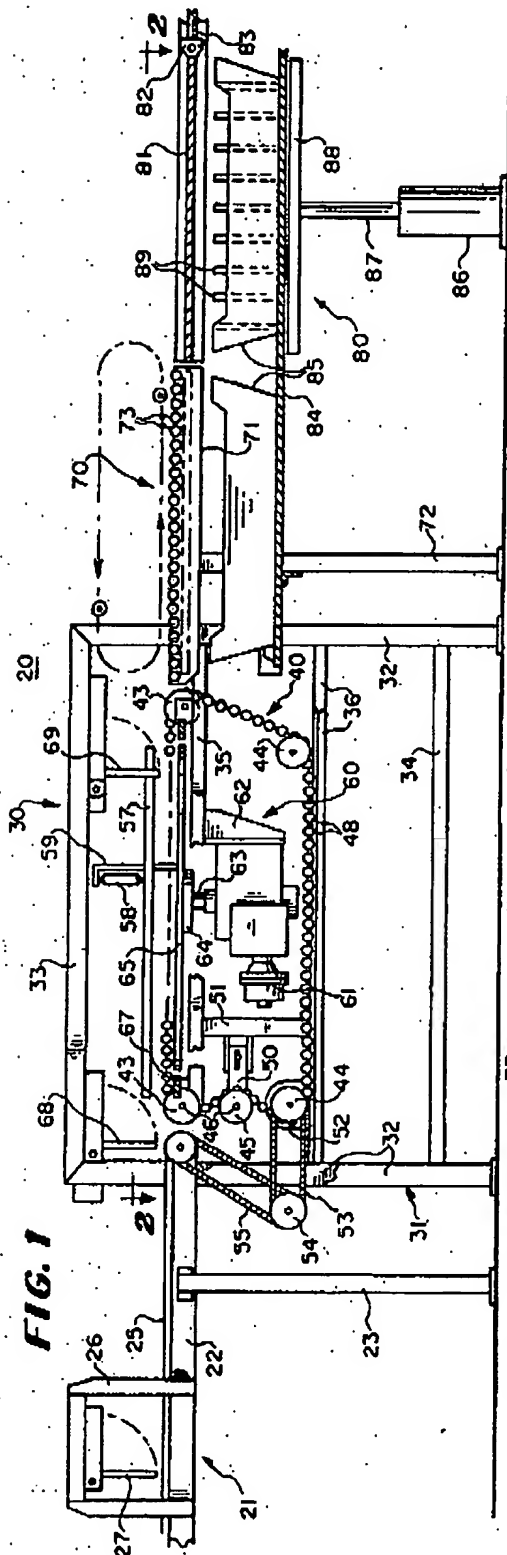
An in-line pattern forming apparatus includes a windowed endless roller conveyor disposed in a longitudinal system path for sequentially receiving sets of articles. A friction shoe shifts the set of articles through the conveyor window to an underlying turntable which is rotatable for selectively reorienting the set, whereupon the lead roller at the end of the window pushes the set off the turntable to a staging support which sequentially receives a plurality of sets to form a pattern. The pattern is then swept as a unit from the staging support to a container loader or other associated apparatus in the system path. Means may be provided for selectively shifting sets of articles on the staging support laterally of the path to facilitate formation of certain patterns.

35 Claims, 26 Drawing Figures

U.S. Patent Jun. 11, 1985

Sheet 1 of 5

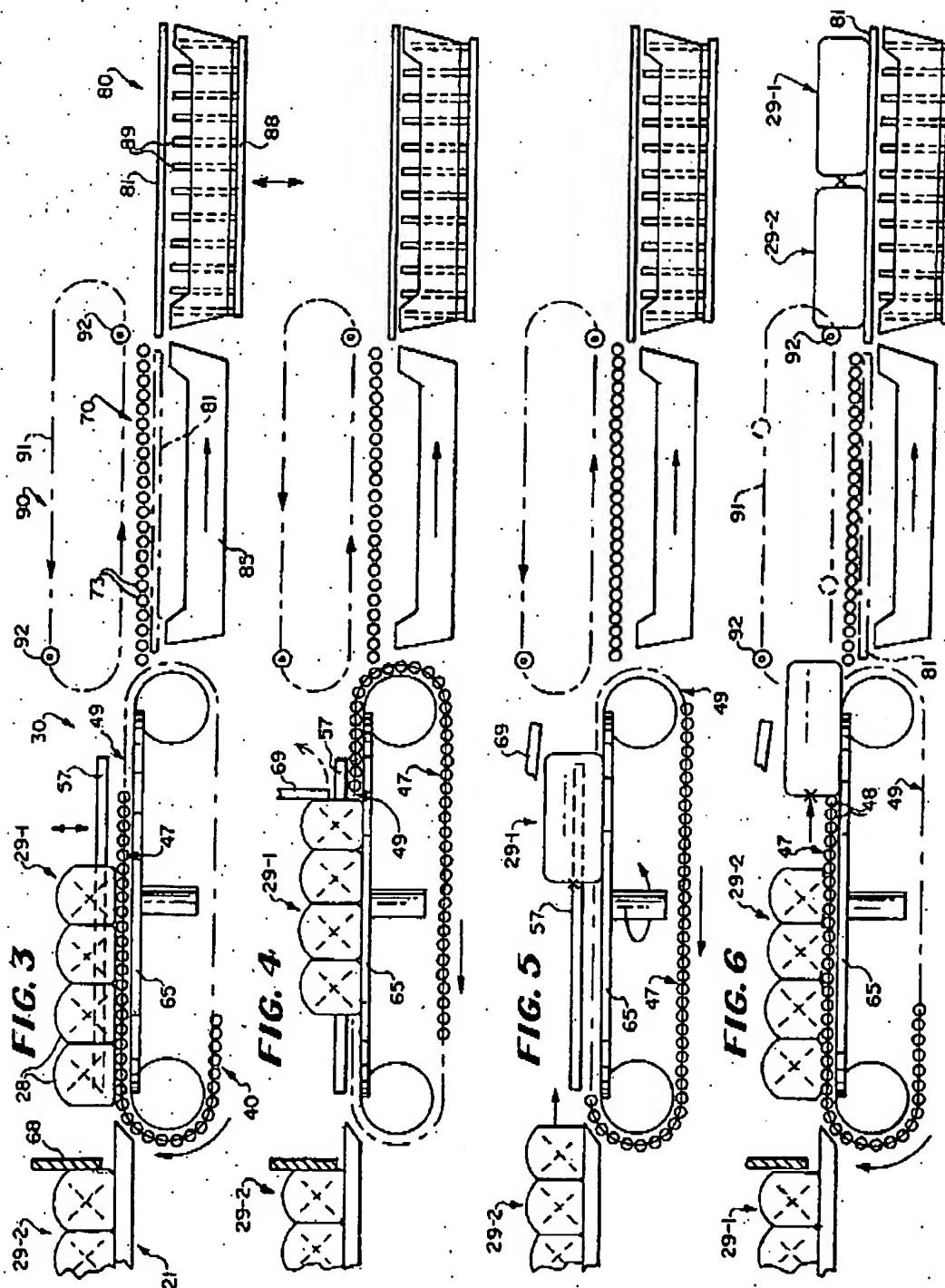
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U.S. Patent Jun. 11, 1985

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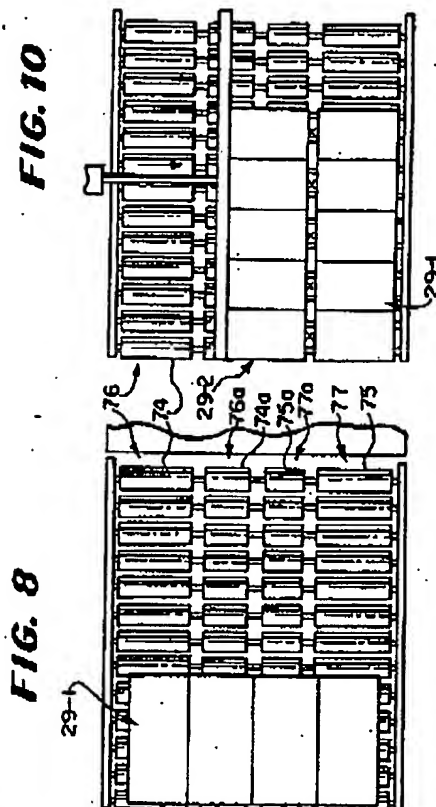
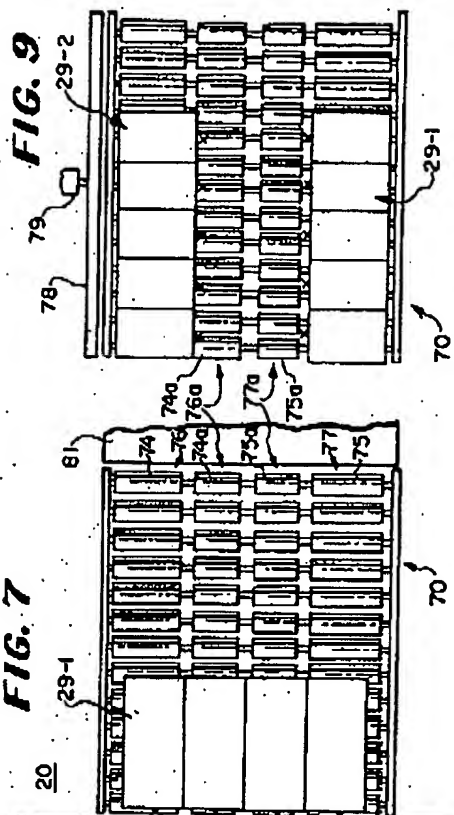
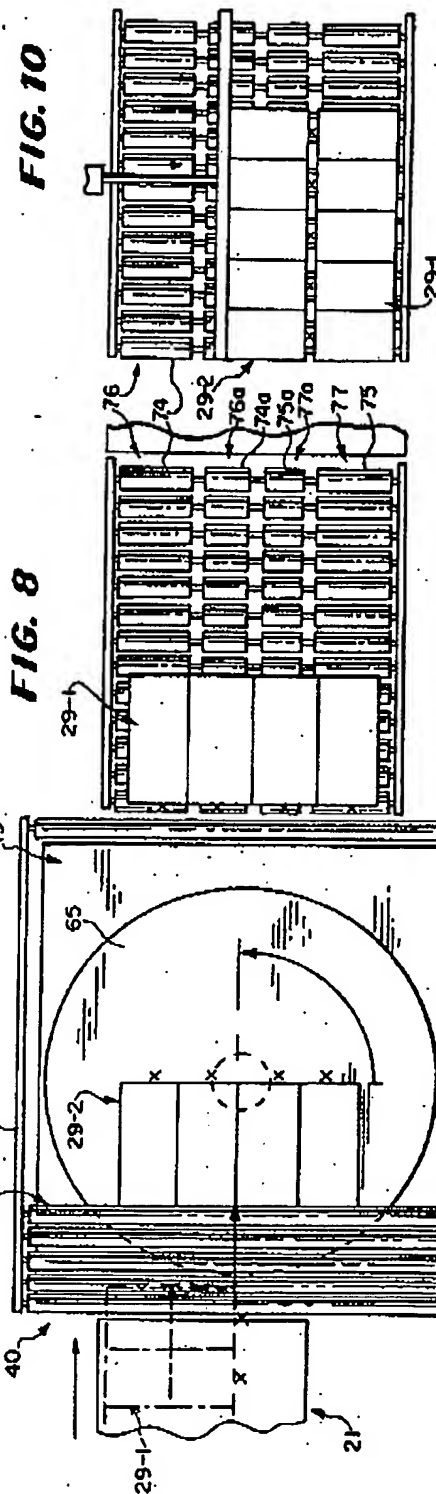
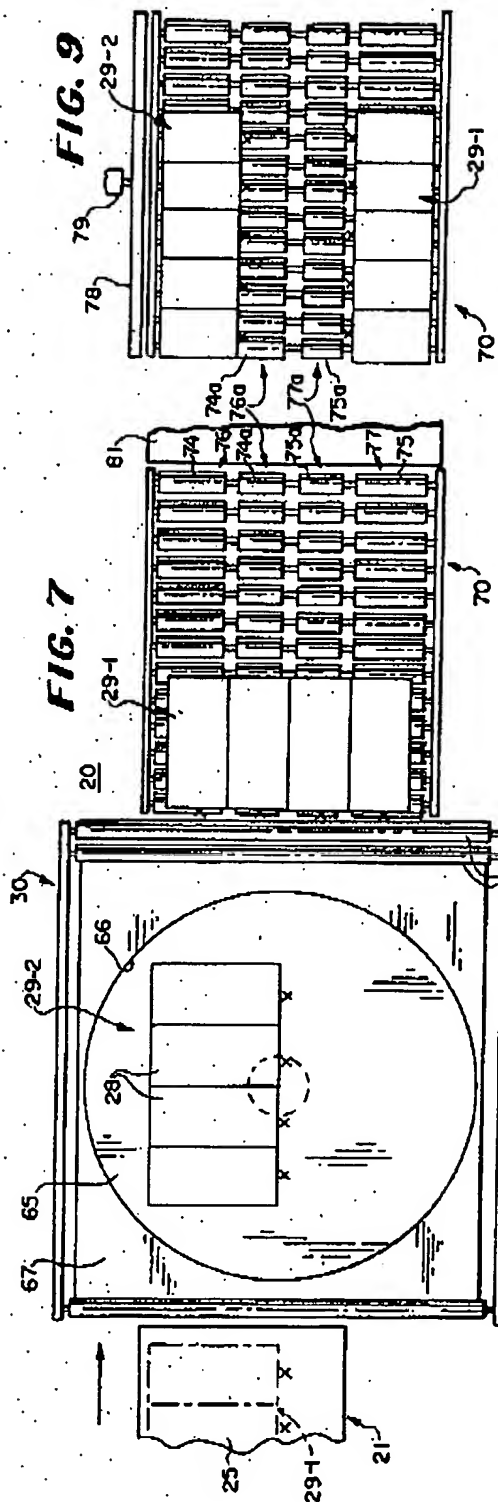
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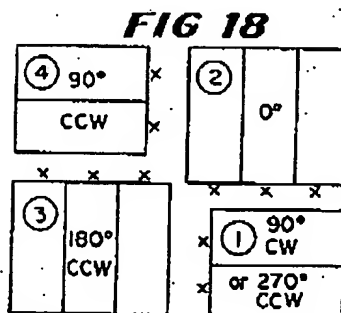
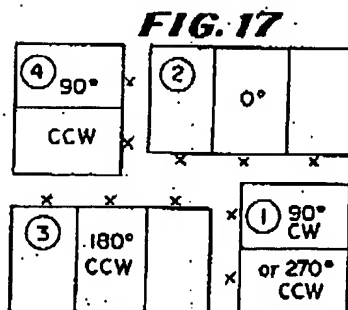
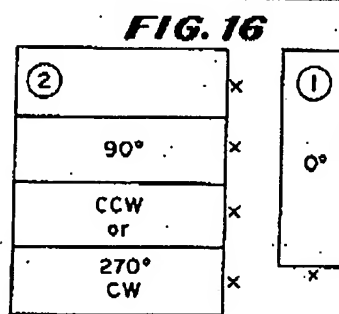
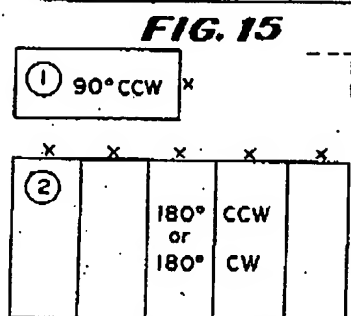
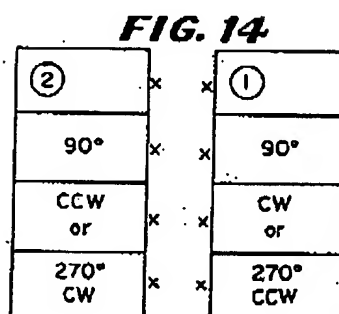
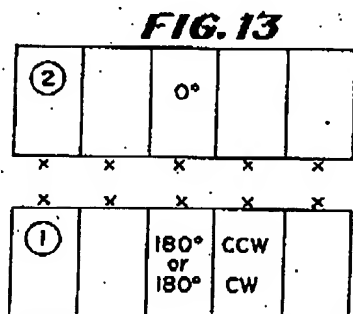
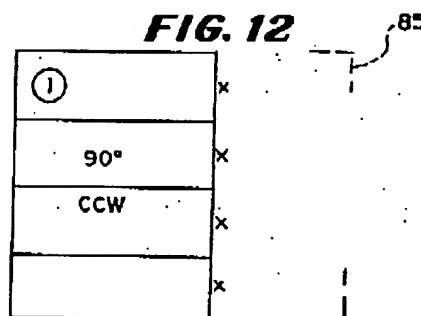
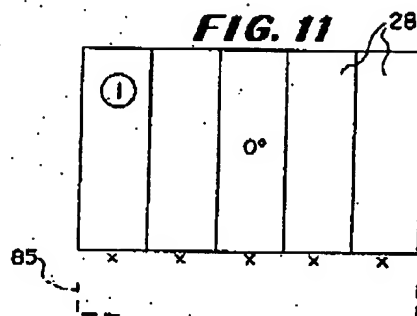
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U.S. Patent Jun. 11, 1985

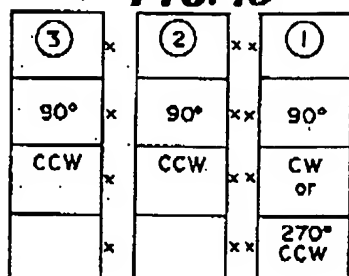
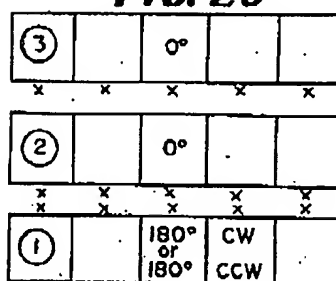
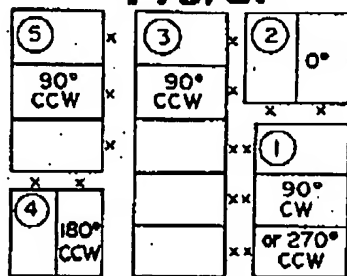
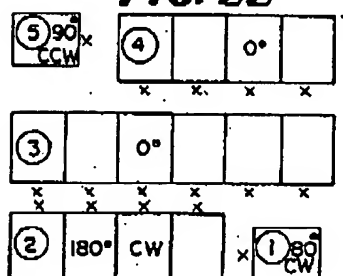
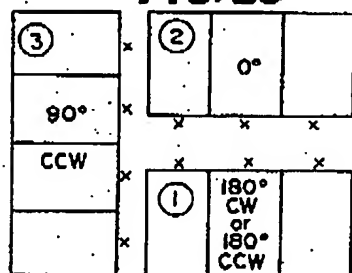
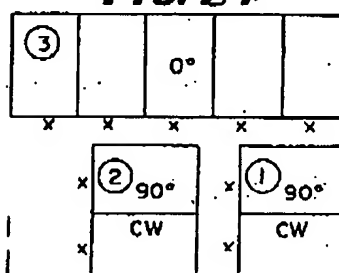
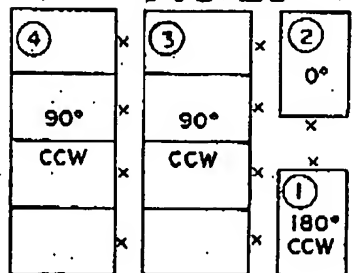
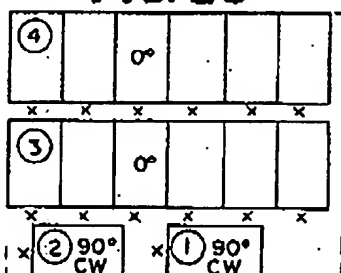
Sheet 4 of 5 4,522,292



U.S. Patent Jun. 11, 1985

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FIG. 19**FIG. 20****FIG. 21****FIG. 22****FIG. 23****FIG. 24****FIG. 25****FIG. 26**

4,522,292

1

PATTERN FORMING APPARATUS AND PRODUCT ORIENTER THEREFOR

BACKGROUND OF THE INVENTION

The present invention relates to product handling equipment and, more particularly, apparatus for reorienting products and arranging the reoriented products in predetermined patterns. The present invention specifically relates to apparatus for the handling of products such as articles of baked goods, including packaged loaves of bread, buns, rolls, boxed products, and the like, as well as other types of goods which must be grouped in predetermined patterns.

It is common for baked goods such as loaves of bread, buns and the like to be packaged by placing them into individual plastic bags with the open end of each plastic bag being gathered and having a gripping closure placed therearound inwardly of the open end. The terminal portion of the bag outwardly of the closure expands to form a fantail end portion which is generally referred to in the bread packaging art as a "tail".

The packaged bread loaves or other baked goods are generally placed in trays or containers for transportation to retail outlets. The packages are typically arranged in a particular pattern for loading in the container, depending upon the size and shape of the container and the size and shape of the individual packages, so as to place the maximum number of packages in each container without damage to the packages and without having any portion of a package, including the tail, project beyond a container.

For this purpose, pattern forming devices are known in the art for arranging individual articles into predetermined patterns and then handling the pattern as a unit for loading into an associated container or the like. One such pattern forming arrangement is used in palletizing machines for arranging layers of packages for stacking on a pallet. But palletizers are designed for use with relatively large packages such as sacks of flour, cement, or the like and are typically not designed for use in handling fragile small articles such as packaged baked goods.

Pattern formers designed for handling packaged baked goods are disclosed, for example, in U.S. Pat. Nos. 3,739,902 and 3,779,363. But these devices, as well as many of the palletizing devices, require one or more changes in direction of the product path during the pattern forming operation. These changes in direction necessarily increase the amount of handling that each package must undergo, thereby increasing the chance of damage to the packaged products.

One type of palletizing apparatus disclosed, for example, in U.S. Pat. No. 2,971,659, effects the formation of patterns of products with only a single direction change. However, this apparatus requires a lifting of the products vertically from the conveyor path in order to effect reorientation thereof.

SUMMARY OF THE INVENTION

It is a general object of the present invention to provide an improved pattern forming apparatus and product orienter therefor which avoids the disadvantages of prior art devices while affording additional structural and operating advantages.

It is an important object of this invention to provide a product orienting apparatus which is characterized by in-line operation, for effecting reorientation of products

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without displacing them from a longitudinal path of travel.

In connection with the foregoing object, it is another object of this invention to provide an improved product orienting apparatus of the type set forth which effects reorientation of the product without lateral restraint thereof.

It is another object of this invention to provide an improved product orienting apparatus of the type set forth which is of simple and economical construction.

In connection with the foregoing objects, it is another object of this invention to provide a pattern forming apparatus which incorporates the product orienting apparatus of the type set forth.

These and other objects of the invention are attained by providing product orienting apparatus comprising means for conveying product in a generally longitudinal path of travel, and support means disposed in the path and defining a reorienting plane, the support means being movable parallel to the reorienting plane for receiving the product from the conveying means along the path and selectively reorienting the product with respect to the path and discharging the reoriented product along the path.

The invention consists of certain novel features and a combination of parts hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the details may be made without departing from the spirit, or sacrificing any of the advantages of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

For the purpose of facilitating an understanding of the invention, there is illustrated in the accompanying drawings a preferred embodiment thereof, from an inspection of which, when considered in connection with the following description, the invention, its construction and operation, and many of its advantages should be readily understood and appreciated.

FIG. 1 is a side elevational view of a pattern forming and container loading apparatus incorporating a product orienting apparatus constructed in accordance with and embodying the features of the present invention;

FIG. 2 is a fragmentary, top plan view of the apparatus illustrated in FIG. 1;

FIGS. 3-6 are enlarged, partially diagrammatic, side elevational views of the apparatus of FIG. 1, illustrating the apparatus at different stages of its operation;

FIGS. 7 and 8 are fragmentary, top plan views, similar to FIG. 2, illustrating the apparatus at two different stages of its operation;

FIGS. 9 and 10 are fragmentary top plan views of the pattern forming region of the apparatus of FIG. 1, illustrating lateral movement of products in formation of a pattern; and

FIGS. 11-26 are diagrammatic plan views of representative patterns which can be formed with the apparatus of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1 and 2 of the drawings, there is illustrated a system, generally designated by the numeral 20, constructed in accordance with and embodying the features of the present invention, for forming groups of articles into patterns and loading the patterns

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into containers. The system 20 includes an infeed conveyor 21 which conveys individual articles along a longitudinal path and groups the articles into sets with each set containing one or more articles. The infeed conveyor feeds the sets of articles to a product orienter 30 which selectively reorients the sets and sequentially transports them to a staging deck 70 on which a predetermined pattern of the sets is assembled, the pattern then being moved as a unit to a container loader 80 for loading into associated containers 85. The infeed conveyor 21, the product orienter 30, the staging deck 70 and the container loader 80 are all disposed in an in-line arrangement for moving the associated articles along a single longitudinal system path without moving the articles from the system path.

The infeed conveyor 21 is of standard construction, including a bed 22 supported on posts 23 (one shown). A roller 24 is rotatably mounted at one end of the bed 22 and receives therearound an endless conveyor belt 25, the support reach of which moves in the direction of the arrow in FIG. 2 for moving articles along the longitudinal system path. Carried by the bed 22 is an upstanding support bracket 26 on which is mounted a grouping gate 27 movable into and out of the path of the products conveyed on the infeed conveyor 21, selectively to stop the conveyed articles 28 to allow them to accumulate into sets 29 (see FIGS. 3-8) having any desired number of articles 28 therein. For purposes of illustration, the articles 28 have been depicted as loaves of bread in plastic bags tied at one end to form a tail in a well known manner, with each loaf extending transversely of the system path, as illustrated in FIG. 2. However, it will be appreciated that the system 20 could be used for handling other types of articles. While the infeed conveyor 21 has been illustrated as relatively narrow, it will be appreciated that it could be substantially wider. Furthermore, there may be provided along the infeed conveyor 21, preferably upstream of the support bracket 26, a lane-diverting mechanism for shifting the incoming train of articles 28 laterally of the infeed conveyor 21. Thus, the incoming train of articles 28 could be selectively positioned at either side of the infeed conveyor 21 or centrally thereof. Also, if desired, selected ones or groups of the articles 28 could be shifted in this manner. Several types of such lane diverting mechanisms are known, one type being sold by Velten & Pulver Inc. under the trademark "SELECT-O-FLOW".

The product orienter 30 includes a frame 31 comprising a plurality of upright posts 32 interconnected at the upper ends thereof by crossbars 33 and interconnected adjacent to the lower ends thereof by crossbars 34. Beams 35 and 36 are disposed intermediate the upper and lower ends of the posts 32 and extend horizontally for supporting associated equipment in a manner to be described below. The product orienter 30 includes an endless window roller conveyor, generally designated by the numeral 40. The window conveyor 40 includes a pair of laterally spaced-apart endless chains 41 and 42, each being guided over a pair of upper sprockets 43 and a pair of lower sprockets 44 and behind a tensioning sprocket 45, corresponding sprockets of the two chains 41 and 42 being fixedly secured to common shafts 46 for rotation about the axes thereof. The window conveyor 40 includes a conveyor section, generally designated by the numeral 47, comprising a plurality of freely-rotating rollers 48, each having the opposite ends thereof respectively secured to the chains 41 and 42 and extending transversely thereof, the rollers 48 being spaced apart

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longitudinally of the chains 41 and 42. The window conveyor 40 also includes a window section 49 which comprises a gap wherein no rollers 48 are provided.

The upper sprockets 43 cooperate to define therebetween the upper flight of the window conveyor 40. When the conveyor section 47 is disposed along the upper flight, the upper surfaces of the rollers 48 cooperate to define a substantially horizontal support plane. The tensioning sprockets 45 are carried on adjustment brackets 50 which are, in turn, supported on upright members 51 of the frame 31. The adjustment brackets 50 are movable for adjusting the tension in the chains 41 and 42. The window conveyor 40 is positioned so that the entry end of the support flight thereof is disposed closely adjacent to the exit end of the infeed conveyor 21.

The shaft 46 for the lower sprockets 44 at the entry end of the window conveyor 40 is supported in pillow blocks 52 (one shown) and carries on one end thereof a sprocket (not shown) engaging an endless chain 53, which also engages a sprocket 54 on a shaft rotatably supported outboard of the frame 31. The sprocket 54 is a double sprocket and also engages a chain 55, which is disposed in engagement with a sprocket 56 mounted on the end of the roller 24 of the infeed conveyor 21. Thus, it will be appreciated that driving force is imparted to the window conveyor 40 from the infeed conveyor 21 by means of the chains 55 and 53. The infeed conveyor 21 is driven by an associated drive unit (not shown) such as an electric motor.

Overlying the upper flight of the window conveyor 40 adjacent to one end of the rollers 48 is an elongated shoe 57 connected to the piston of an air cylinder 58 which is carried by a support 59 mounted on the frame 31 for effecting vertical reciprocating movement of the shoe 57 between a retracted position illustrated in FIG. 1 and a lower operating position in frictional engagement with the upper surfaces of the rollers 48 of the window conveyor 40 (see FIG. 4). It will be appreciated that when the shoe 57 is disposed in its operating position the clockwise rotation of the window conveyor 40, as viewed in FIG. 1, results in a counterclockwise rotation of the rollers 48 along the upper flight of the window conveyor 40 about their axes for causing articles supported thereon to be held stationary for a purpose to be explained more fully below. A window roller conveyor is disclosed, for example, in U.S. Pat. No. 4,030,620.

The product orienter 30 also includes a turntable assembly, generally designated by the numeral 60, carried by the frame 31. More particularly, the turntable assembly 60 includes a motor 61 mounted on a bracket 62 supported on the beams 35, the motor 61 having a vertically upwardly extending output shaft 63 which is fixedly secured to a hub 64 of a circular platform 65. The upper surface of the platform 65 is disposed immediately beneath the upper flight of the window conveyor 40 closely adjacent thereto and substantially parallel to the support plane thereof. The platform 65 is disposed in a circular aperture 66 in a rectangular support plate 67 carried by the frame 31, the upper surfaces of the support plate 67 and the platform 65 being substantially coplanar for providing a substantially continuous support surface. The platform 65 is mounted for rotation about the axis of the shaft 63, the peripheral edge of the platform 65 being disposed very closely adjacent to the surrounding edge of the support plate 67. Carried by the frame 31 and overlying the window

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conveyor 40 are two gates 68 and 69, respectively disposed adjacent to the exit ends of the infeed conveyor 21 and the window conveyor 40 for pivotal movement into and out of the path of articles conveyed thereby.

The staging deck 70 includes a frame having parallel side rails 71 and support posts 72. Rotatably supported between the side rails 71 are a plurality of longitudinally spaced-apart and transversely extending segmented rollers 73, each being rotatable about the axis of a shaft 73a. Each of the rollers 73 includes four laterally-aligned segments 74, 74a, 75 and 75a rotatable independently of each other. The segments 74 cooperate to define a section 76 of the staging deck 70, while the segments 74a cooperate to define a section 76a, the segments 75 cooperate to define a section 77, and the segments 75a cooperate to define a section 77a, the sections 76, 76a, 77 and 77a being disposed side-by-side along the staging deck 70. The upper surfaces of the rollers 73 cooperate to define a support surface which is disposed substantially coplanar with the upper surface of the turntable platform 65, with the entry end of the staging deck 70 disposed closely adjacent to the exit end of the support plate 67 of the turntable assembly 60. Overlying the staging deck 70 along one side edge thereof is an elongated pusher bar 78 secured to the piston of an air cylinder 79, disposed for effecting reciprocating movement of the pusher bar 78 transversely of the system path.

The container loader 80 includes a retractable support plate 81, the upper surface of which is disposed just below the level of the rollers 73 of the staging deck 70. The support plate 81 is mounted for sliding horizontal movement in an associated frame and is provided at one end thereof with a pair of clevis brackets 82, respectively coupled by connecting rods 83 to an associated drive mechanism (not shown) for effecting reciprocating movement of the support plate 81 between a normal support position illustrated in solid line in FIG. 1 and a retracted position disposed beneath the staging deck 70, and illustrated in broken line in FIG. 1.

Alternatively, the support plate 81 could be mounted so that in its normal support position its upper surface is substantially coplanar with the support surface defined by the rollers 73 of the staging deck 70. In this case, the support plate 81 could be fitted with cams which lower it upon retraction so that it can pass beneath the rollers of the staging deck 70, and raise it upon return to its normal support position. In this way the conveyed articles would not have to drop on to the support plate 81.

Disposed beneath the support plate 81 is a container conveyor 84, which may be of any desired type, for conveying containers 85 such as baskets or the like to and from a loading position beneath the support plate 81. While, for purposes of illustration, empty containers 85 have been shown as approaching the loading station from beneath the staging deck 70, it will be appreciated that they could approach the loading position from any other desired direction. In the configuration illustrated in FIG. 1 the container conveyor 84 would preferably enter laterally beneath the staging deck 70 so as to avoid interference with the product orienter 30. This arrangement also permits empty containers 85 to be fed laterally beneath the staging decks 70 of a plurality of parallel production lines like that illustrated in FIG. 1, it being common in bakeries, for example, to have separate lines for different types and sizes of product, several of which types may fit into the same type of container 85. The container conveyor 84 may leave the

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loading position beneath the support plate 81, either laterally of the system path or longitudinally to the right, as viewed in FIGS. 1 and 2. Alternatively, the container conveyor 84 could enter directly beneath the support plate 81 laterally thereof and exit either laterally or longitudinally.

The container loader 80 includes an air cylinder 86 having a vertically reciprocating piston rod 87 which is fixedly secured at the upper end thereof to a plate 88 carrying a plurality of upstanding parallel pins 89, which are much greater in number than the number of articles assembled in each pattern to be loaded in the container 85. The container conveyor 84, and the bottom of each of the containers 85 are provided with a plurality of apertures for respectively receiving the pins 89 upwardly therethrough in the loading position, as illustrated in FIG. 1, when the piston rod 87 is in its fully extended position. The upper ends of the pins 89 are substantially coplanar and define a support plane which is spaced a slight distance beneath the support plate 81 when the piston rod 87 is in its fully extended position. When the piston rod 87 is retracted, the pins are completely withdrawn to a position (not shown) beneath the container conveyor 84. Such retractable pin container loaders are disclosed, for example, in U.S. Pat. Nos. 4,030,620 and 4,154,043.

The staging deck 70 is provided with a discharge mechanism 90 (FIG. 3) for transferring completed patterns of articles formed thereon to the container loader 80. The discharge mechanism 90 may be of any of several types but, for purposes of illustration, it is shown as including a continuous chain 91 carrying two pusher bars 92 at equidistantly spaced-apart locations thereon, each of the pusher bars 92 projecting over the staging deck 70 parallel thereto and transversely of the system path. The chain 91 has a lower reach extending longitudinally of the system path and so positioned that when the pusher bars 92 are disposed along that reach they extend only a slight distance above the staging deck 70 for engagement with a pattern of articles thereon to move the pattern as a unit longitudinally from the staging deck 70 to the support plate 81 of the container loader 80.

It will be appreciated that the pincushion type of container loader 80 described above is merely illustrative, and other types of container loading devices could be used for different types of containers. Thus, for example, for very shallow types of containers such as trays or the like, the empty container could simply be fed forwardly (to the right as viewed in FIG. 1) from beneath the staging deck 70 in synchronism with the discharge mechanism 90 thereof, the conveyed articles 28 being allowed to fall directly into the container as they leave the end of the staging deck 70.

It will be appreciated that a suitable electrical control circuit (not shown) will be provided for the system 20 to control the operation thereof, the control circuit including suitable sensors, such as photoelectric sensors, limit switches and the like, in a well known manner. The circuitry will also include suitable sequencing means which is selectively operable for operating the system 20 in any of a number of different predetermined sequences for respectively forming different predetermined patterns of articles 28. Representative patterns of articles 28 which can be formed with the system 20 are illustrated, respectively, in FIGS. 11 through 26. In each of these figures the pattern is shown in its final configuration as it leaves the staging deck 70 and is

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loaded into the container loader 80. All of the patterns are generally rectangular in outline to correspond with a rectangular container 85, and it will be assumed that the four corners of the pattern fit respectively in the four corners of the container 85. In those patterns where this condition does not obtain, the unoccupied corners of the container 85 are diagrammatically illustrated in broken line. Different shapes and sizes of container and different shapes and sizes of article 28 can be accommodated with the present invention. Thus, the patterns of FIGS. 11-26 include examples of different sizes and shapes of articles 28.

The long dimension of the container 85 could be disposed either parallel to or perpendicular to the longitudinal axis of the system path. Each of the patterns is illustrated in top plan view, so that the staging deck 70 is to the left. Thus, the pattern arrives from the left and the individual sets of articles in each pattern arrive at the staging deck 70 from the left. To facilitate an understanding of the formation of the patterns, the sets 29 of articles in each pattern are respectively numbered with encircled numerals in the order in which they arrive at the staging deck 70, and each set 29 bears a designation indicating the angular rotation which it undergoes on the product orienter 30. Thus, for example, the designation "0°" indicates that the set of articles passes through the product orienter 30 without rotation; the designation "90° CW" indicates that the set was rotated 90° clockwise; and the designation "90° CCW" indicates that the set was rotated 90° counterclockwise.

Referring now also to FIGS. 3 through 8 of the drawings, the operation of the system 20 will be described in detail. For purposes of illustration, the operation will be described during formation of the pattern illustrated in FIG. 14, and in order better to correlate this description with FIG. 14, the first set 29 of the pattern of FIG. 14 has been designated 29-1 in FIGS. 3-8, while the second set has been designated 29-2. It will be understood that normally the system 20 will be set to form a particular pattern and will typically operate repeatedly to form that pattern through a large number of cycles. If the type of product article or the type of container being handled is changed, then the pattern will have to be changed and this will necessitate changes in settings of the associated control circuit.

Typically, the articles 28 are conveyed from left to right along the infeed conveyor 21, with the long dimension of the articles 28 being disposed transversely of the path of travel and with the tail of the article 28 disposed downwardly, as viewed in FIGS. 2, 7 and 8. The articles 28 are spaced apart along the infeed conveyor 21 and are accumulated by the grouping gate 27 into sets 29. In the configuration illustrated each set 29 will comprise four articles 28. Thus, the gate 27 may be moved down to its position blocking the path of the articles 28 along the infeed conveyor 21 for stopping them and allowing the conveyor belt 25 to pass therebeneath until four articles 28 have been accumulated in a side-by-side contiguous set 29, at which time the gate 27 is lifted to allow the set 29 to pass to the exit end of the infeed conveyor 21. It will be appreciated that many types of accumulating devices for conveyor systems are known and that any suitable accumulating mechanism could be used to form the sets 29, the gate 27 being described simply for purposes of illustration.

When the first set 29-1 reaches the exit end of the infeed conveyor 21, it is stopped by the gate 68 and held until the appropriate time for entry onto the product

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orienter 30. The infeed conveyor 21 is positioned so that the set 29-1 will enter upon the product orienter 30 toward the upper half of the turntable platform 65, as viewed in FIG. 2, and this configuration is used for formation of all of the patterns illustrated in FIGS. 11-26. However, it will be appreciated that, if desired for the formation of other types of patterns, the positioning of the infeed conveyor 21 with respect to the product orienter 30 could be changed, or the lane diverting mechanism of the infeed conveyor 21 could be operated, so that the sets 29 would enter at other locations along the platform 65.

The window conveyor 40 moves on demand in a clockwise direction, as viewed in FIG. 1. When the leading end of the conveyor section 47 arrives at the upper flight of the window conveyor, the gate 68 is lifted and the infeed conveyor 21 feeds the set 29-1 onto the conveyor section 47 of the window conveyor 40. In this regard, it will be appreciated that the adjacent ends of the infeed conveyor 21 and the window conveyor 40 are closely spaced a distance substantially less than the width of a conveyed article 28 so that the articles 28 pass freely between the two conveyors without interruption. Alternatively, transition support means between the two conveyors could be provided, if desired, in a well known manner. The conveyor section 7 of the window conveyor 40 supports the set 29-1 and conveys it to the right over the support plate 67 and the platform 65. When the entire set 29 has moved onto the window conveyor 40, the gate 68 is returned to its blocking position for stopping the next set 29-2 on the infeed conveyor 21, as illustrated in FIG. 3.

As the set 29-1 is conveyed over the platform 65 by the window conveyor 40, the gate 69 is lowered to its blocking position, illustrated in FIG. 4, to prevent the conveyed articles 28 from being fed off the product orienter 30. When the first set 29-1 has reached the predetermined desired location over the platform 65, the shoe 57 is lowered into frictional engagement with the rollers 48 of the window conveyor 40 along the upper flight thereof for causing the engaged rollers to rotate in a counterclockwise direction, as viewed in FIG. 4. This counterclockwise rotation of the rollers 48 serves to hold the set 29-1 stationary while the conveyor section 47 of the window conveyor 40 continues to pass therebeneath substantially without friction. As the trailing end of the conveyor section 47 passes beneath the articles 28 of the set 29-1, the articles 28 drop sequentially through the window section 49 onto the platform 65. When the entire set 29-1 has dropped onto the platform 65, the shoe 57 is lifted back to its normal retracted position.

The platform 65 is then rotated 90° clockwise to bring the set 29-1 to the position illustrated in FIG. 5, the window section 49 being long enough to accommodate unobstructed rotation of the set 29-1 through any desired angle up to 180°. When the leading end of the conveyor section 47 again arrives at the upper flight of the window conveyor 40, the gate 68 is lifted to allow the next set 29-2 to be conveyed onto the window conveyor 40, as indicated in FIG. 5. When the leading end of the conveyor section 47 reaches the reoriented set 29-1 it pushes it off the platform 65 and support plate 67 and onto the segmented rollers 73 of the staging deck 70, as indicated in FIG. 6. It will be appreciated that the set 29-1 is now disposed with the longitudinal axes of the individual articles 28 extending parallel to the longitudinal system path. Since the set 29-1 contains four

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articles 28, it spans all of the sections 76, 76a, 77 and 77a of the staging deck 70, as indicated in FIG. 7. Since the rollers 73 are not powered, the set 29-1 remains at the entry end of the staging deck 70, with the tails of the articles 28 all pointing back toward the product orienter 30. When the set 29-1 has passed from the platform 65, the gate 68 is lowered to its blocking position.

The second set 29-2 is then stopped in the desired position over the platform 65 and, by operation of the shoe 57, is then dropped through the window section 49 onto the platform 65, as described above. When the complete set 29-2 has been deposited on the platform 65, the platform 65 is rotated 90° counterclockwise to bring the set 29-2 to the position illustrated in FIG. 8. Then, as the leading end of the conveyor section 47 of the window conveyor 40 engages the set 29-2, it pushes it off the platform 65 and the support plate 67 onto the staging deck 70, pushing the set 29-1 ahead of it so that the pattern of FIG. 14 results on the staging deck 70.

Before the set 29-1 of the next pattern is moved onto the staging deck 70, the completed pattern is discharged therefrom by use of the discharge mechanism 90. Thus, the chain 91 is actuated for moving one of the pusher bars 92 down into engagement with the trailing end of the pattern and pushing it longitudinally off the staging deck 70 and onto the support plate 81 of the container loader 80, as indicated in FIG. 6. The chain 91 is then stopped in the position illustrated in FIG. 6 to allow the next set 29-1 to be moved onto the staging deck 70, the lower one of the pusher bars 92 serving as a stop to prevent articles 28 from traveling off the end of the staging deck 70 until the desired time for discharge of the next pattern. The support plate 81 is then retracted back beneath the staging deck 70 to the position illustrated in broken line in FIG. 6, retrograde movement of the pattern of articles 28 being prevented by the pusher bar 92. Thus, as the support plate 81 is retracted, the sets 29-1 and 29-2 of the formed pattern drop onto the upper ends of the pins 89, which are then lowered for lowering the pattern of articles 28 into the container 85. The filled container 85 is then conveyed away and an empty container is moved into loading position over the pins 89, which are then moved back up through the corresponding openings in the bottom of the container 85 to their product-receiving position. The support plate 81 is returned to its original loading position for receiving the next pattern of articles 28.

It will be appreciated that instead of the support plate 81 being moved immediately back to its normal support position after discharge of the previous set of articles therefrom, it could be retained in its retracted position beneath the staging deck 70 until the next set of articles 28 is ready to be discharged therefrom by the discharge mechanism 90. Then, the support plate 81 could be moved back to its normal support position in synchronism with the movement of the pusher bar 92 so that the conveyed articles could drop sequentially thereonto, thereby avoiding any sliding relative movement of the conveyed articles with respect to the support plate 81.

Furthermore, it will be appreciated that the lateral feeding of the empty containers 85 to the system 20 is accommodated by the presence of the staging deck 70. However, if a different type of feeding movement of the containers 85 were permissible, the staging deck 70 could be eliminated, and the sets of articles 28 could be discharged from the product orienter 30 directly to the container loader 80, the patterns of articles then being formed directly on the support plate 81.

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The operation of the system 20 is similar for formation and loading of each of the other patterns illustrated in FIGS. 11-19, 21, and 23-25. Thus, for each of these patterns, after each set 29 has undergone the indicated rotation on the turntable platform 65, it will be in position so that when it is discharged from the product orienter 30 it will move into the indicated pattern position, either directly or by being pushed into that position by succeeding sets 29 of the pattern.

However, in the case of the patterns of FIGS. 20, 22, and 26, certain sets 29 of these patterns will not be in proper position as they exit the product orienter 30. In order to move these sets into proper position, the pusher bar 78 is used. Thus, referring, for example, to the pattern of FIG. 20, the first set 29-1 will be in proper position and can be pushed from the product orienter 30 directly onto the staging deck 70 and remain in that position. The second set 29-2 however, undergoes no rotation and, therefore, will simply be pushed across the top of the turntable assembly 60 and arrive on the staging deck 70 in the position illustrated in FIG. 9. The set 29-2 cannot remain in this position because the third set 29-3 also undergoes no rotation and will be discharged into the same position on the staging deck 70 occupied by the set 29-2. Accordingly, before discharge of the set 29-3 from the product orienter 30, the set 29-2 is moved laterally by the pusher bar 78 to the position illustrated in FIG. 10, thereby providing a space for the arrival of a set 29-3. Similar lateral movements by the pusher bar 78 are also necessary for the third sets 29 of the patterns in FIGS. 22 and 26, as indicated by the arrows in those figures.

It will also be noted that for patterns such as those in FIGS. 22 and 26, the division of the staging deck 70 into parallel sections 76, 76a, 77 and 77a serves effectively to prevent sets 29 deposited on one of the sections from being affected by later deposit of another set 29 on other sections. Thus, by the provision of four segments on each of the rollers 73 all of the patterns illustrated in FIGS. 11-26 can be accommodated.

It will be understood that in the patterns described above, a rotation of 90° in one direction could be accomplished by a rotation of 270° in the opposite direction. Similarly, a rotation of 180° could be in either direction. The directions indicated in FIGS. 11-26 are merely illustrative. In the formation of any pattern the system 20 is arranged so that as each set 29 is conveyed onto the product orienter 30 it will stop in a position corresponding to the upper right-hand corner of the container 85, as viewed in FIGS. 11-26. This is controlled by the positioning of the stop 69 longitudinally of the system path and the lateral positioning of the infeed conveyor 21 or the position of the lane-diverting mechanism thereof. If a different shape container is used or if the container 85 is to be loaded in a different orientation, a corresponding adjustment of the stopping location of each set 29 on the product orienter 30 must be made.

While the preferred embodiment of the invention has been described, it will be understood that a number of modifications thereof are possible. Thus, as indicated above, any of several different types of product accumulating devices could be used for grouping the articles 28 into sets on the infeed conveyor 21. While a pusher bar 78 has been disposed along the upper side of the staging deck 70, as viewed in FIG. 2, it will be appreciated that it could also be disposed along the opposite side or on both sides, depending on the particular pat-

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terns to be formed. Alternatively, the pusher bar 78 could be eliminated entirely, and the lane diverting mechanism of the feed conveyor 21 could be used for selectively shifting the lateral positioning of sets 29 on the product orienter 30 to avoid interference with other sets on the staging deck 70. While the staging deck 70 has been disclosed as comprised of segmented rollers 73 for minimal friction, it will be appreciated that a flat plate could also be used. The shoe 57 has been described for facilitating shifting of sets 29 through the window section 49 of the window conveyor 40, the shoe 57 could be eliminated and the stop 69 could alone serve to sweep the sets 29 off the trailing edge of the conveyor section 47 and onto the platform 65. Finally, while discharge from the staging deck 70 has been described as being longitudinally of the system path, once the pattern has been formed it could be discharged from the staging deck 70 in any direction except back toward the product orienter 30.

From the foregoing, it can be seen that there has been provided an improved pattern former and product orienter therefor which is characterized by a completely in-line operation, the product reorienting and pattern forming all being accomplished along the longitudinal path of travel of articles through the system 20. Thus, since the product orienter 30 is disposed directly in the longitudinal path of travel of the articles along the system 20, the articles can be fed longitudinally directly onto and off of the product orienter 30 without any changes in direction of the path of travel of the articles. This results in a system of simplified construction characterized by minimum handling of the articles. Furthermore, reorientation of the article sets is accomplished by the product orienter 30 without the necessity of displacing the sets vertically from the system path.

We claim:

1. Product orienting apparatus comprising means for conveying product in a generally longitudinal path of travel, and support means disposed in said path, said support means including reorienting means defining a fixed reorienting plane and movable for reorienting said product in said plane with respect to said path, said support means including transfer means continuously movable parallel to said reorienting plane for receiving said product from said conveying means along said path and supportively carrying said product to a position overlying said reorienting means and depositing the product thereon and discharging the reoriented product along said path.

2. The product orienting apparatus of claim 1, and further including means in said path upstream of said support means for grouping individual articles of product in sets with each set including one or more articles.

3. The product orienting apparatus of claim 1, wherein said reorienting means includes rotatable means rotatably movable for reorienting said product.

4. The product orienting apparatus of claim 3, wherein said rotatable means is rotatable in either direction.

5. The product orienting apparatus of claim 1, wherein said transfer means undergoes a type of motion different from that of said reorienting means.

6. The product orienting apparatus of claim 5, wherein said reorienting means includes rotating means for reorienting the product, said support means including means movable longitudinally of said path for moving the product to and from said rotating means.

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7. Product orienting apparatus comprising means for conveying product in a generally longitudinal path of travel, a turntable disposed in said path for receiving product and selectively rotatable in said path about a predetermined axis for reorienting the product with respect to said path, said turntable being immovable in directions parallel to said axis, and endless transfer means for supportively carrying the product from said conveying means to said turntable and depositing the product thereon and for moving the product from said turntable to said conveying means longitudinally of said path.

8. The product orienting apparatus of claim 7, wherein said transfer means pushes the product while moving it from said turntable.

9. The product orienting apparatus of claim 8, wherein said transfer means defines a support plane, said turntable being disposed parallel to and immediately beneath said support plane.

10. The product orienting apparatus of claim 7, wherein said transfer means includes a portion undergoing longitudinal movement parallel to said path.

11. The product orienting apparatus of claim 7, wherein said turntable is mounted for rotational movement in either direction about said axis.

12. Product orienting apparatus comprising means for conveying product in a generally longitudinal path of travel, a turntable disposed in said path for receiving product and selectively rotatable in said path for reorienting the product with respect to said path, endless transfer means including a conveyor section for receiving product from said conveying means and transporting the product along said path to a loading station disposed above said turntable and a window section for dropping the product therethrough, and means for shifting the product at said loading station from said conveyor section and through said window section onto said turntable, said conveyor section engaging the reoriented product on said turntable for moving said product from said turntable to said conveying means longitudinally of said path.

13. The product orienting apparatus of claim 12, wherein said transfer means comprising an endless conveyor having a product support reach, said turntable being disposed parallel to and immediately beneath said support product reach.

14. The product orienting apparatus of claim 12, and further including means in said path upstream of said transfer means for grouping individual articles of product in sets with each set including one or more articles.

15. The product orienting apparatus of claim 12, wherein said turntable is mounted for rotational movement in either direction about a predetermined axis.

16. The product orienting apparatus of claim 12, wherein said shifting means effects shifting of the product from said conveyor section to said turntable without lateral restraint of the product.

17. The product orienting apparatus of claim 16, wherein said conveyor section of said transfer means comprises a plurality of free rollers extending transversely of said path and spaced apart longitudinally thereof, said shifting means comprising a shoe frictionally engageable with said rollers for effecting rotation thereof in response to movement of said transfer means for shifting the product from said conveyor section.

18. Pattern forming apparatus for arranging articles into one of a plurality of different patterns, said apparatus comprising means for conveying articles in a gener-

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ally longitudinal path of travel, means in said path for grouping the articles in sets with each set including one or more articles, support means disposed in said path, said support means including reorienting means defining a fixed reorienting plane and movable for reorienting said product in said plane with respect to said path, said support means including transfer means continuously movable parallel to said reorienting plane for receiving a set of articles from said conveying means along said path and supportively carrying the set to a position overlying said reorienting means and depositing the set thereon and discharging the reoriented set along said path, staging means disposed in said path for sequentially receiving a plurality of sets of articles from said support means for forming a predetermined pattern of articles, and discharge means for moving said pattern of articles as a unit from said staging means.

19. The pattern forming apparatus of claim 18, wherein said staging means comprises a bed of free rollers extending transversely of said path and spaced apart longitudinally thereof.

20. The pattern forming apparatus of claim 19, wherein each of said rollers includes two or more independently rotatable sections respectively disposed on opposite sides of the midline of said path.

21. The pattern forming apparatus of claim 18, wherein said discharge means comprises pusher means for sweeping the pattern of articles from said staging means longitudinally of said path.

22. The pattern forming apparatus of claim 18, and further including container loading means disposed in said path downstream from said staging means for receiving a pattern of articles discharged therefrom and loading the pattern of articles into an associated container.

23. The pattern forming apparatus of claim 18, wherein said reorienting means includes rotating means for reorienting the set of articles and said transfer means includes longitudinally moving means for moving the set of articles to and from said rotating means.

24. The pattern forming apparatus of claim 18, wherein the predetermined pattern comprises a planar array of the articles.

25. The pattern forming apparatus of claim 18, wherein said staging means includes means for selectively moving sets of articles thereon transversely of said path.

26. Pattern forming apparatus for arranging articles into one of a plurality of different patterns, said apparatus comprising means for conveying articles in a generally longitudinal path of travel, means in said path for grouping the articles in sets with each set including one or more articles, a turntable disposed in said path and defining a fixed reorienting plane for receiving a set of articles and selectively rotatable in said plane for reorienting the set of articles with respect to said path, staging means disposed in said path for sequentially receiving a plurality of sets of articles from said turntable for forming a predetermined pattern of articles, endless transfer means for supportively carrying sets of articles sequentially to a position overlying said turntable from said conveying means and depositing the sets on said turntable and for moving the sets from said turntable to said staging means, and discharge means for moving the pattern of articles as a unit from said staging means.

27. The pattern forming apparatus of claim 26, wherein said transfer means pushes the set of articles for moving it from said turntable.

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28. The pattern forming apparatus of claim 26, and further including container loading means disposed in said path downstream from said staging means for receiving a pattern of articles discharged therefrom and loading the pattern of articles into an associated container.

29. The pattern forming apparatus of claim 26, wherein the predetermined pattern comprises a planar array of articles.

30. Pattern forming apparatus for arranging articles into one of a plurality of different patterns, said apparatus comprising means for conveying articles in a generally longitudinal path of travel, means in said path for grouping the articles in sets with each set including one or more articles, a turntable disposed in said path for receiving a set of articles and selectively rotatable in said path for reorienting the set of articles with respect to said path, endless transfer means including a conveyor section for receiving a set of articles from said conveying means and transporting the set of articles along said path to a loading station disposed above said turntable and a window section for dropping the set of articles therethrough, means for shifting the set of articles at said loading station from said conveyor section and through said window section onto said turntable, said conveyor section engaging the reoriented set of articles on said turntable for moving the set of articles from said turntable longitudinally of said path, staging means disposed in said path downstream from said turntable for sequentially receiving a plurality of sets of articles from said turntable for forming a predetermined pattern of articles, and discharge means for moving the pattern of articles as a unit from said staging means.

31. The pattern forming apparatus of claim 30, wherein said turntable is mounted for rotational movement in either direction about a predetermined axis.

32. The pattern forming apparatus of claim 30, and further including container loading means disposed in said path downstream from said staging means for receiving a pattern of articles discharged therefrom and loading the pattern of articles into an associated container.

33. The pattern forming apparatus of claim 30, wherein the predetermined pattern comprises a planar array of articles.

34. Pattern forming apparatus for arranging into one of a plurality of different patterns, articles conveyed along a generally longitudinal path of travel, said apparatus comprising means in said path for grouping the articles into sets with each set including one or more articles and discharging the sets along the path, means in said path for gathering a plurality of said sets into a predetermined pattern and discharging the pattern as a unit, and support means disposed in said path, said support means including reorienting means defining a fixed reorienting plane and movable for reorienting a set of articles in said plane with respect to said path, said support means including transfer means continuously movable parallel to said reorienting plane for receiving sets from said grouping means along said path and supportively carrying the sets to a position overlying said reorienting means and depositing the sets thereon and discharging the sets along the path, said grouping means and said gathering means and said reorienting means being disposed substantially in longitudinal alignment along said path.

35. The pattern forming apparatus of claim 34, wherein said gathering means is disposed downstream of said reorienting means.

* * *



US005317859A

United States Patent [19]

Schneider et al.

[11] Patent Number: **5,317,859**[45] Date of Patent: **Jun. 7, 1994**[54] **PRODUCT ORIENTER AND LOADER**

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[21] Appl. No.: **954,953**[22] Filed: **Sep. 30, 1992**[51] Int. Cl.³ **B65B 5/10; B65B 35/58**[52] U.S. Cl. **53/534; 53/251;**
53/260; 53/544[58] Field of Search **53/252, 251, 250, 249,**
53/534, 544, 260, 259, 255, 543, 531[56] **References Cited****U.S. PATENT DOCUMENTS**

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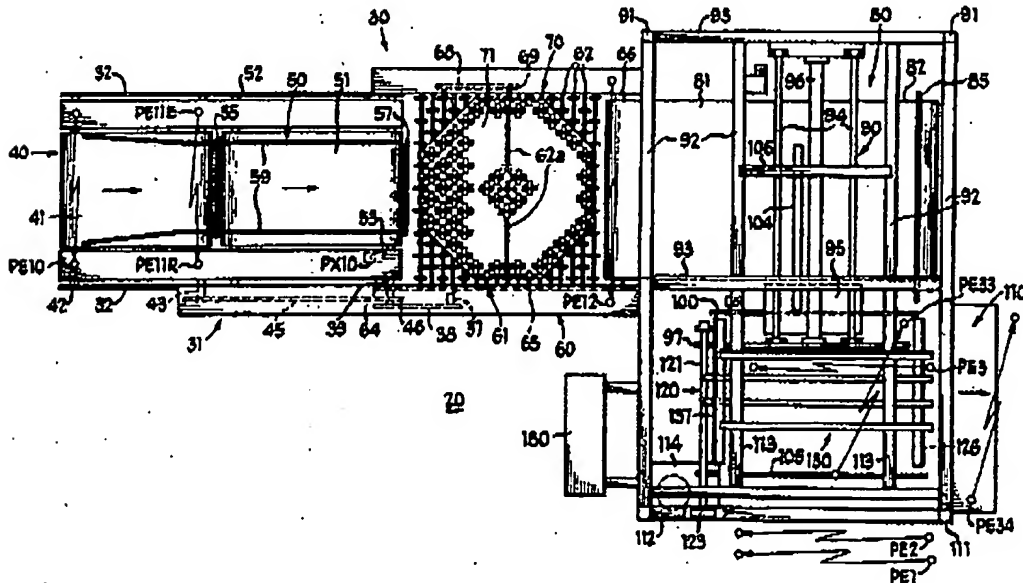
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*Primary Examiner—James F. Coan**Attorney, Agent, or Firm—Emrich & Dithmar*[57] **ABSTRACT**

A product orienting and loading system includes a powered disk conveyor which receives product to be oriented from an infeed conveyor. A turntable is parallel to the support plane of the disk conveyor and is movable between a lowered position below the support plane and a raised position above the support plane and accommodating rotation of the turntable to orient the product. The turntable has cruciform slots for respectively receiving the disks to allow the turntable to pass to its lowered position in any of several rotational orientations spaced 90° apart. The reoriented product is transferred to an endless window conveyor overlying a container supported at a loading level of a loading station. A counter-rotating pusher shifts the product through the window of the window conveyor into the container while the window conveyor moves the container in a discharge direction. Empty containers are delivered to the loading station at a delivery level from which a first elevator lifts them to a standby level and then to an access level, from which they are picked up by a second elevator and carried to the loading level.

22 Claims, 11 Drawing Sheets

Microfiche Appendix Included
(188 Microfiche, 3 Pages)

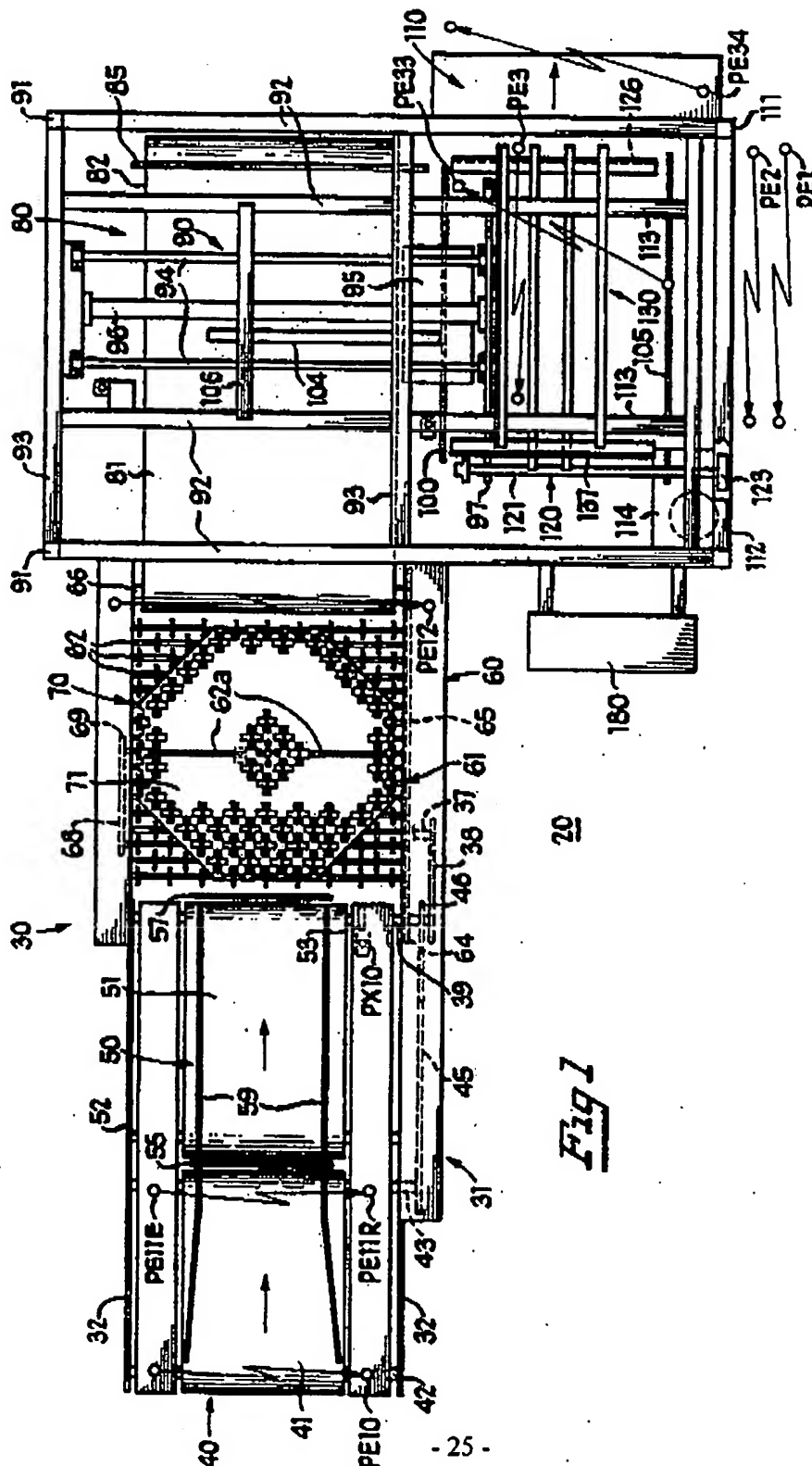


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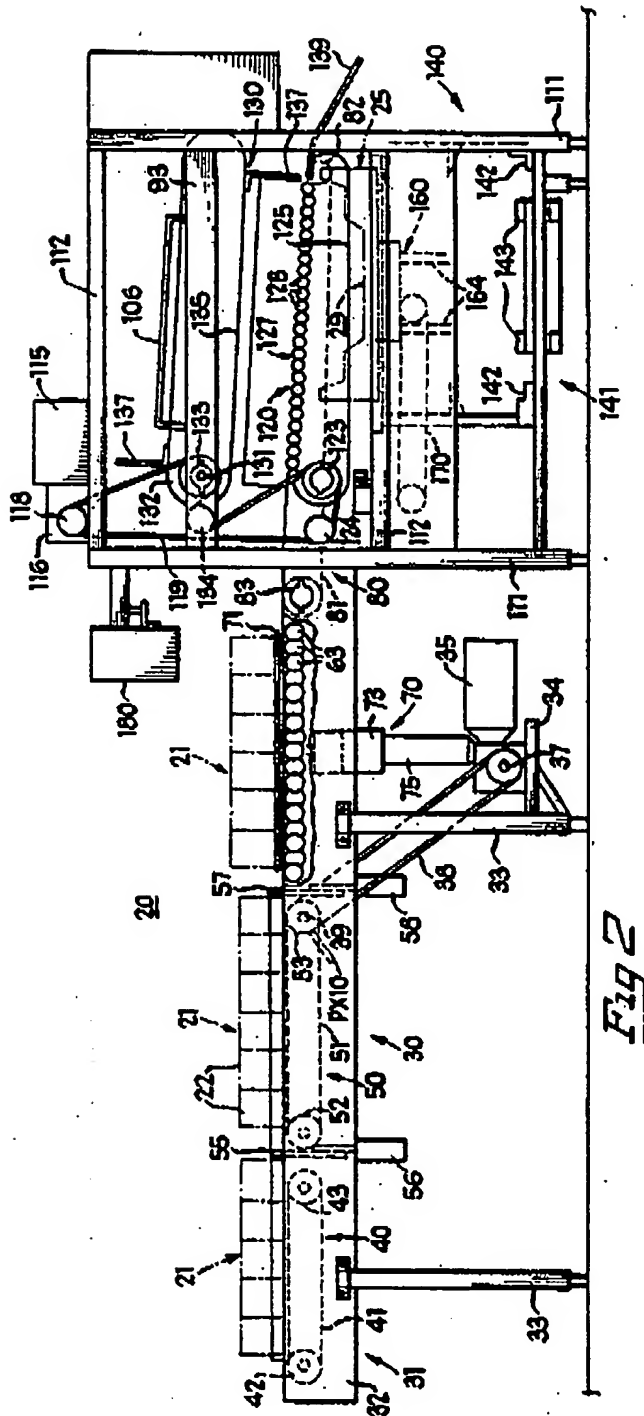


Fig. 2

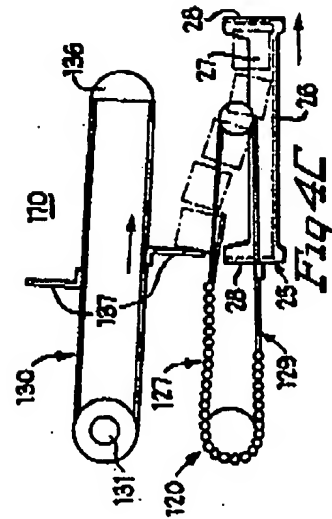


Fig. 4C

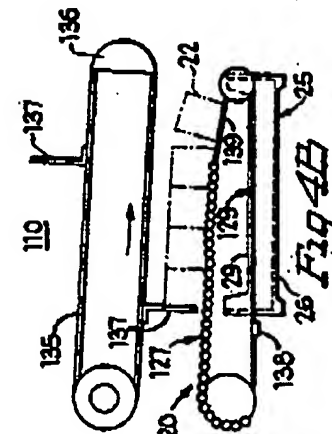


Fig. 4D

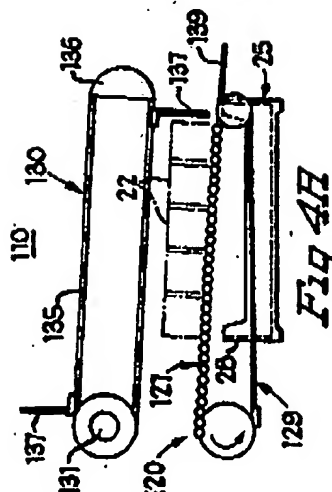


Fig. 4E

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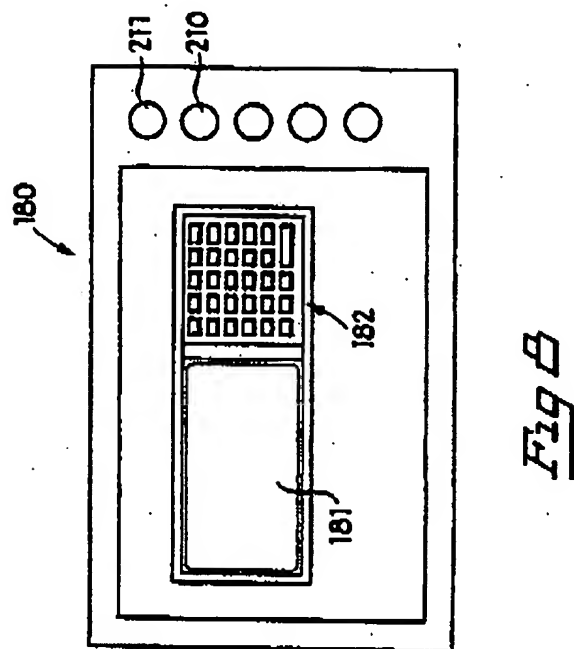


Fig 6

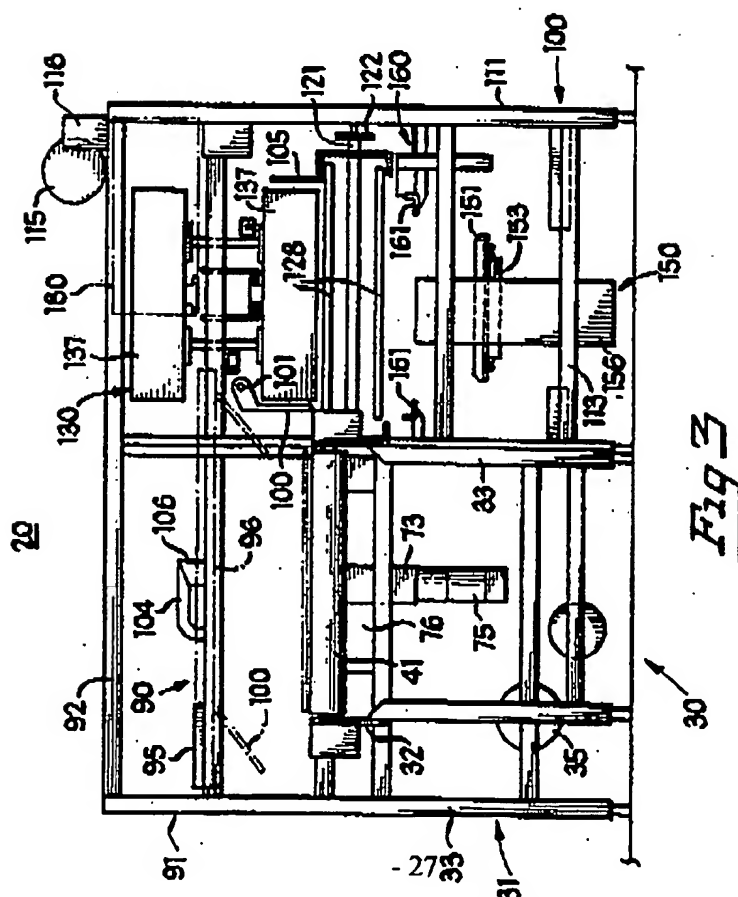


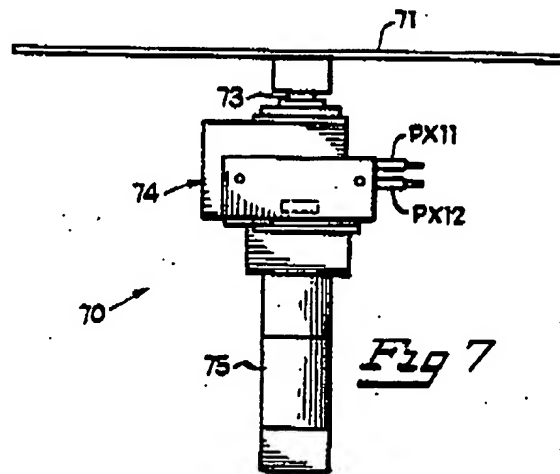
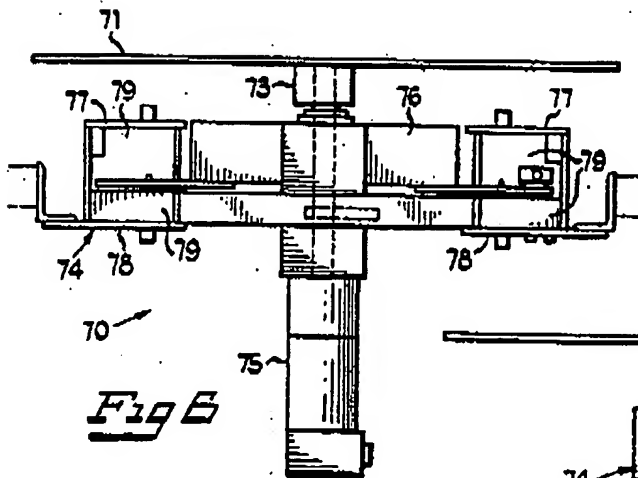
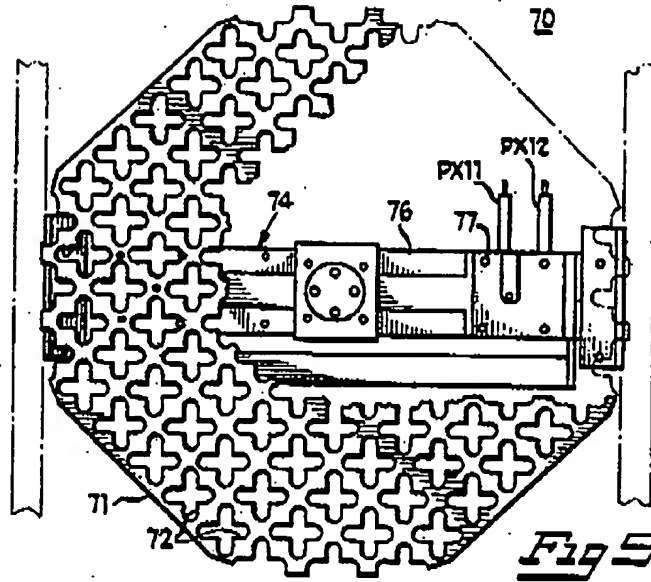
Fig 3

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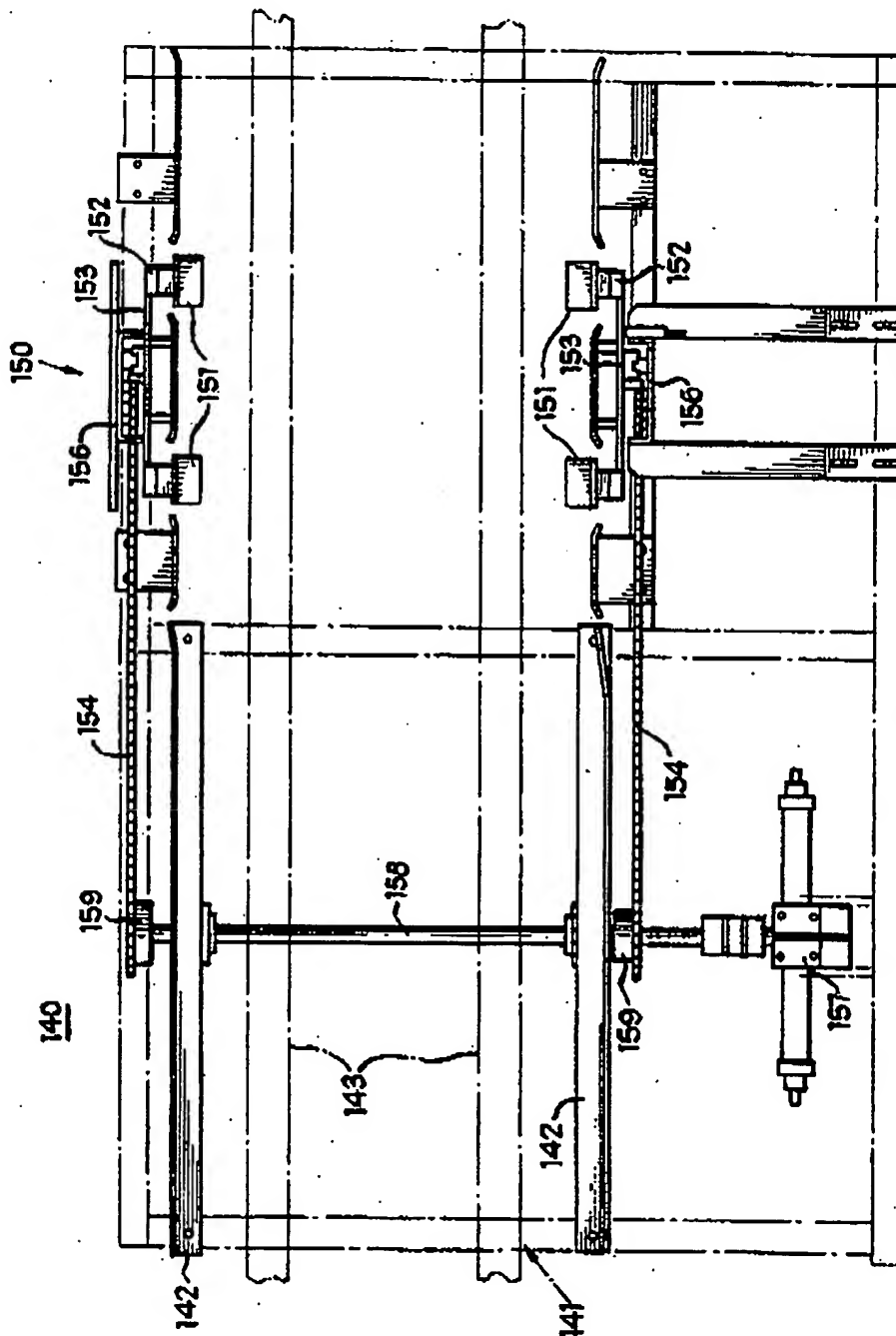


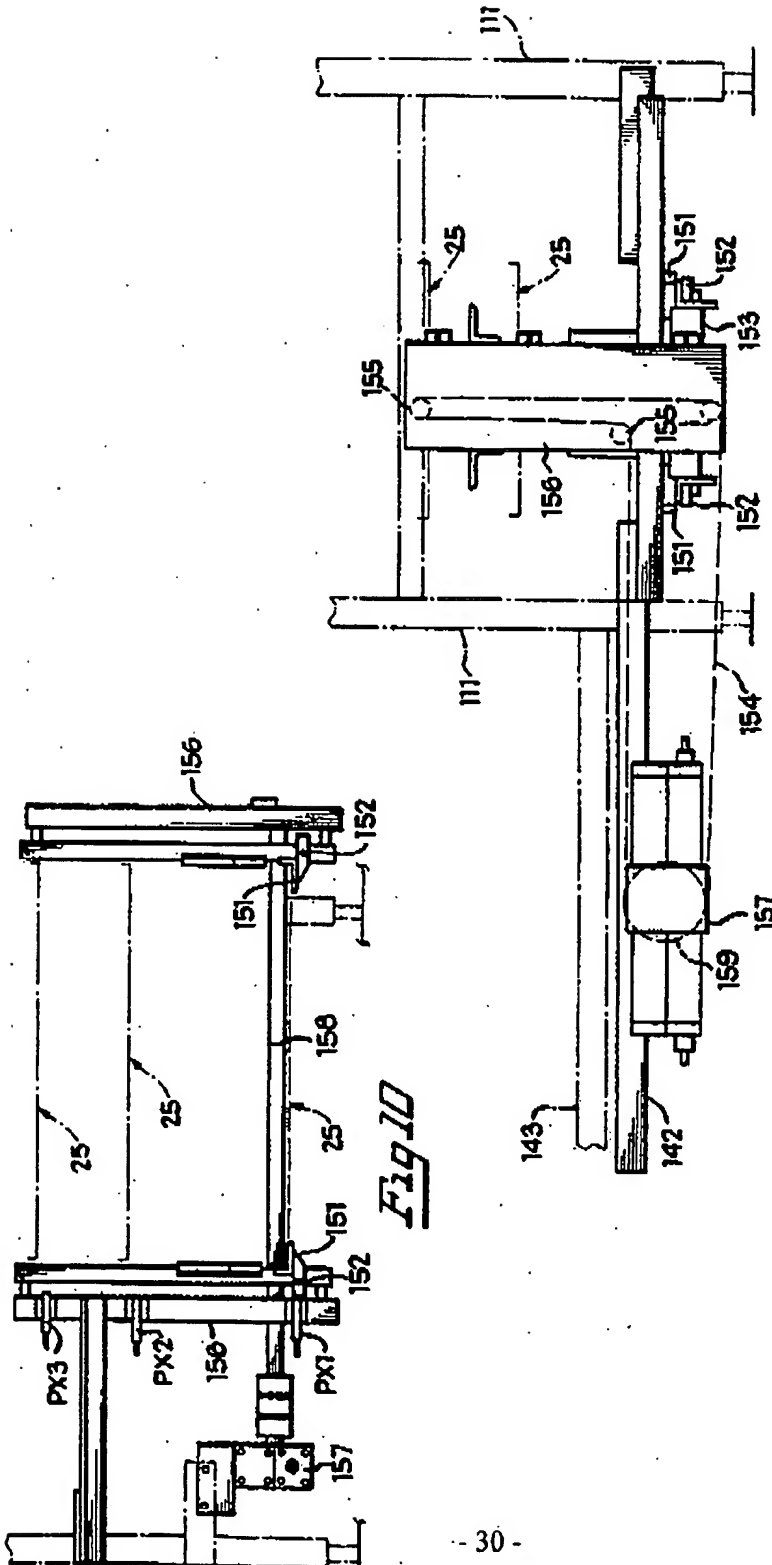
Fig. 9

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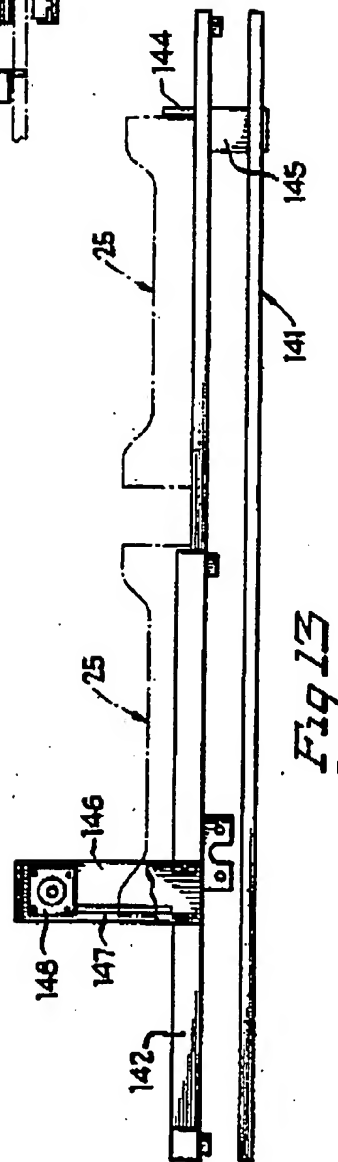
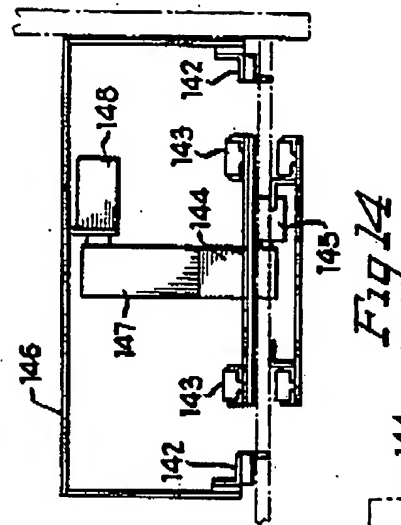
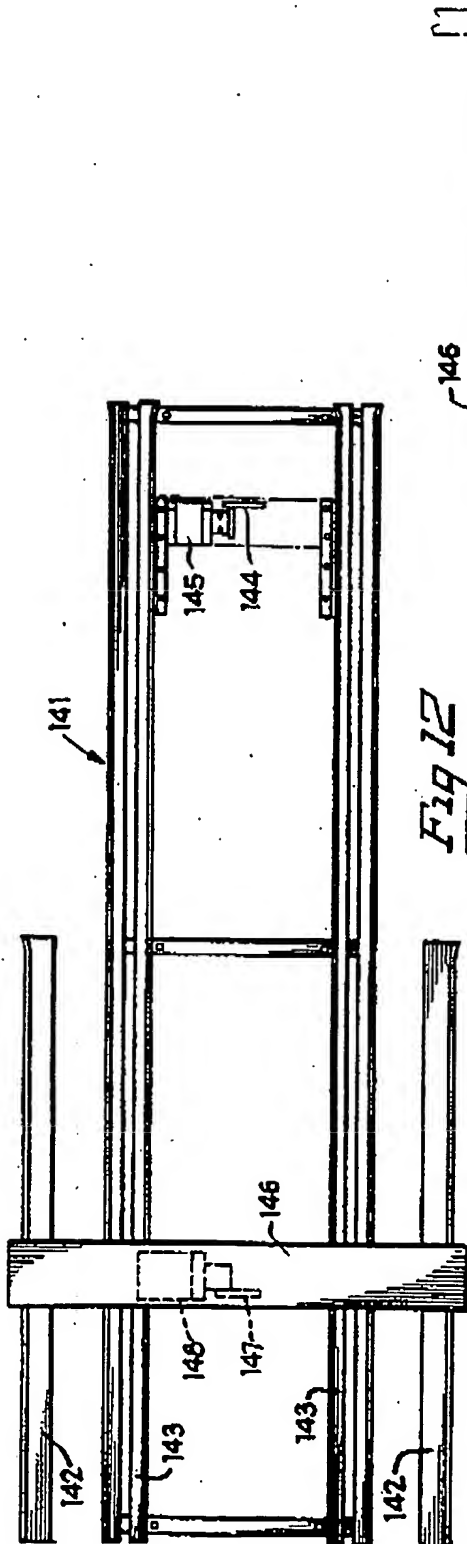


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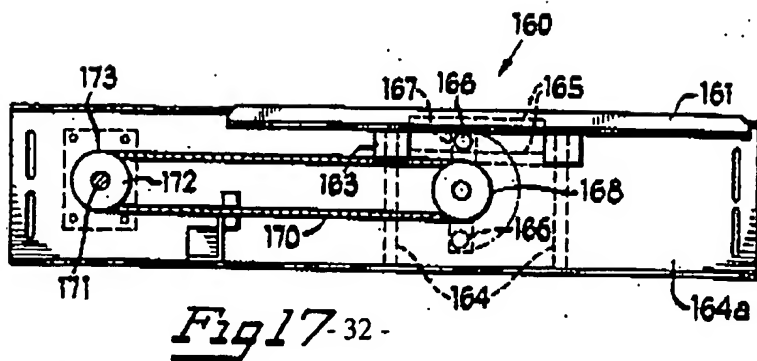
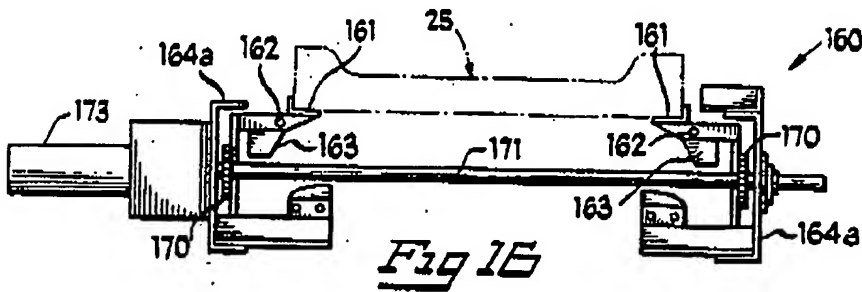
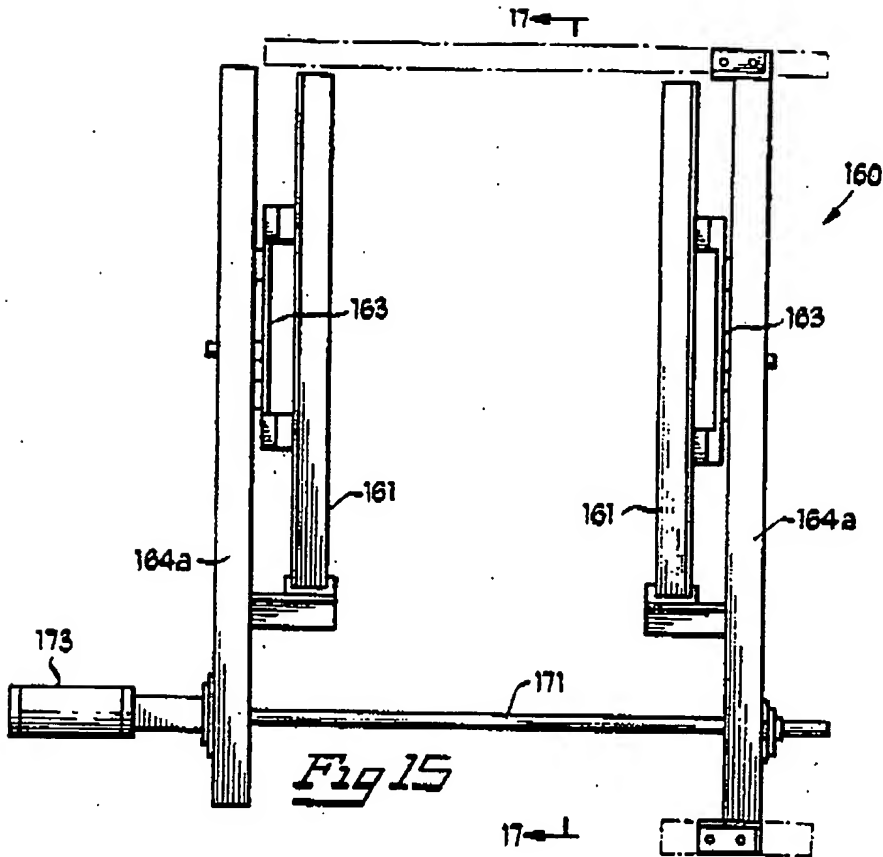


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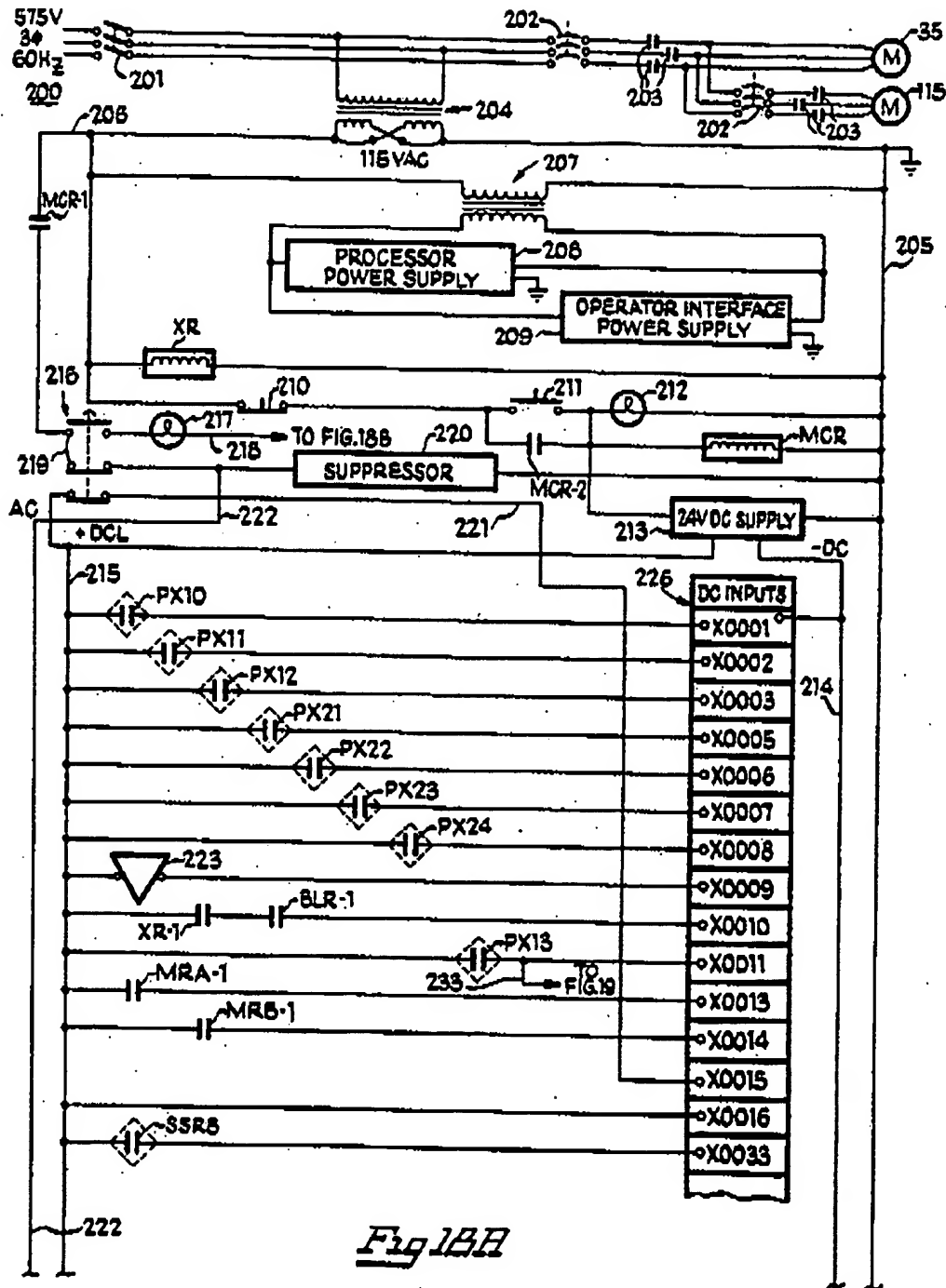


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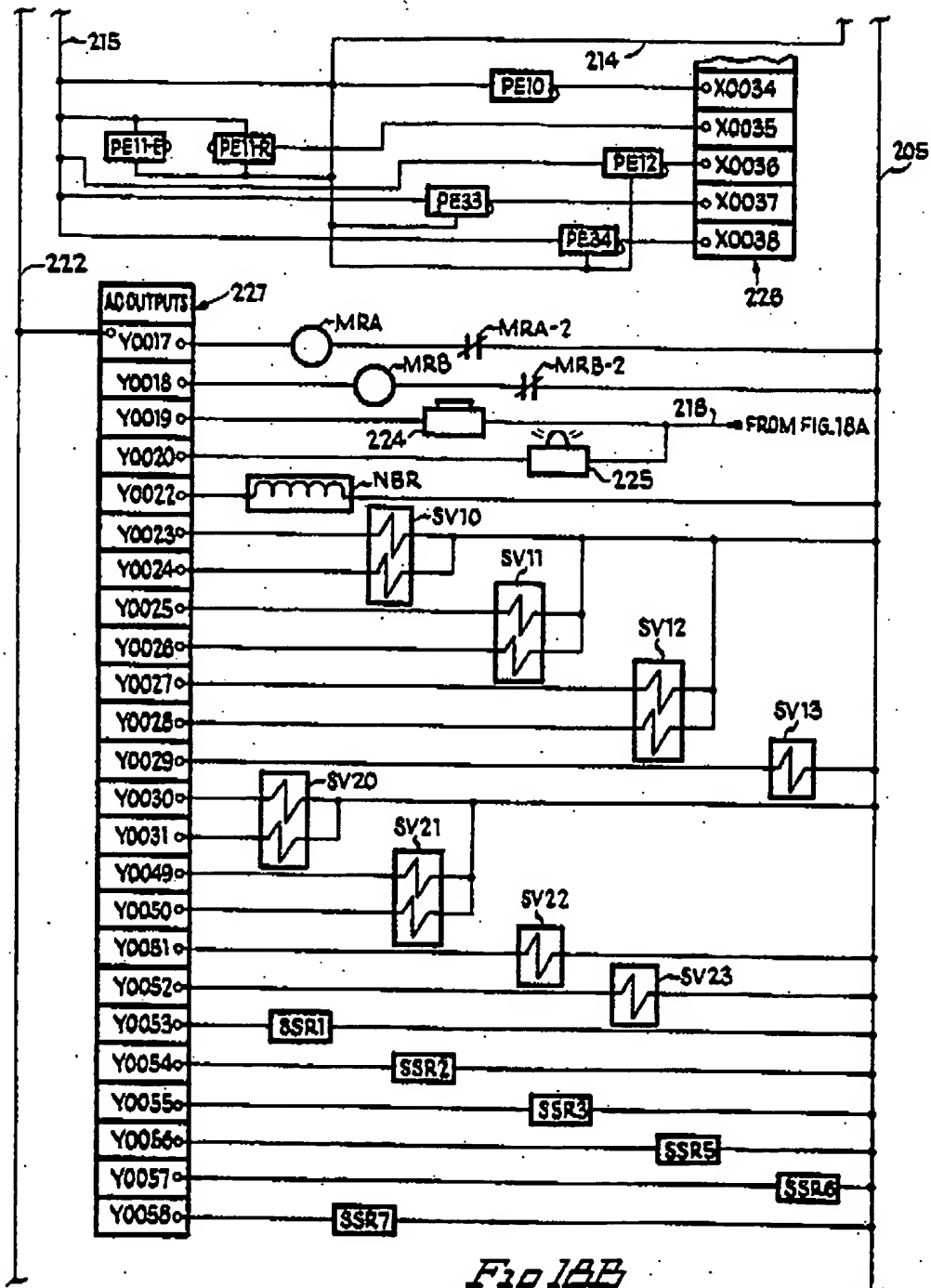


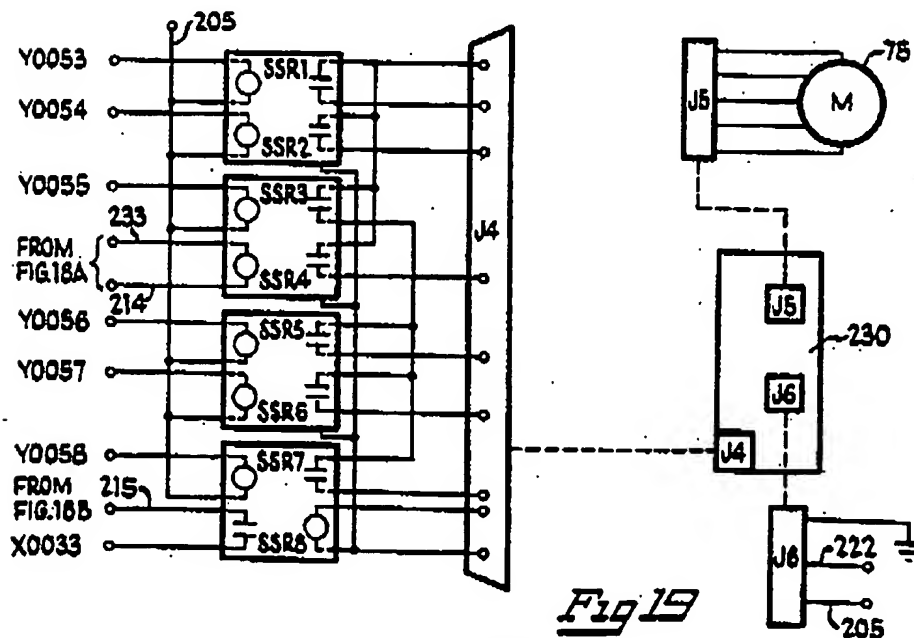
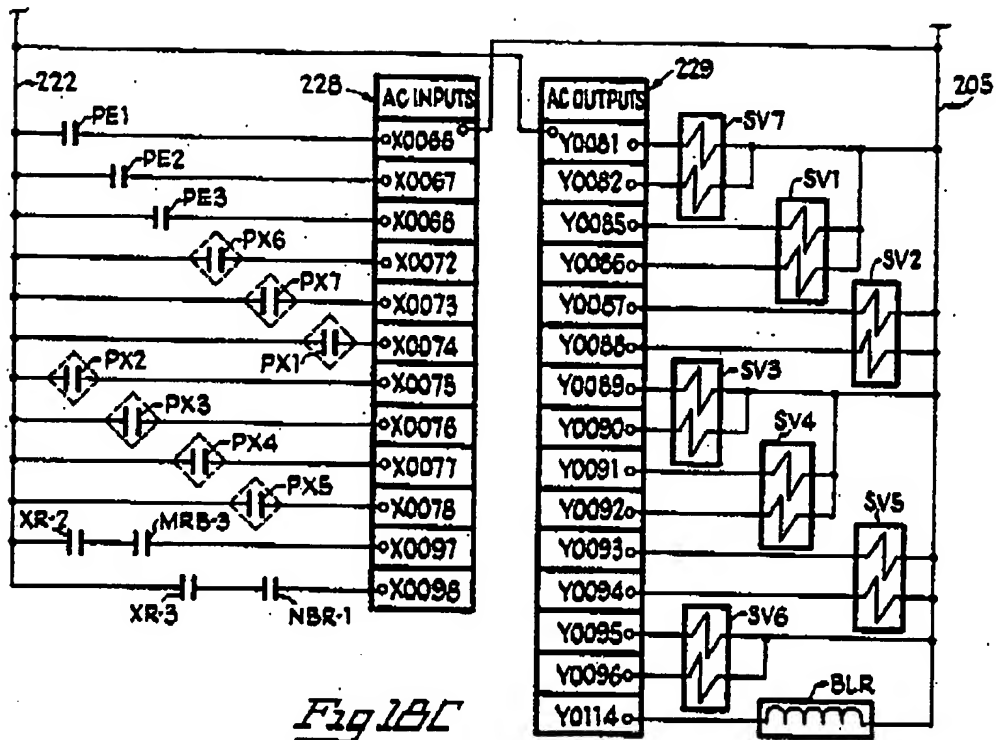
Fig 1AB

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PRODUCT ORIENTER AND LOADER**MICROFICHE APPENDIX**

There is submitted herewith a Microfiche Appendix including two microfiche of 69 frames each and one microfiche of 50 frames, setting forth in "rung" logic notation a listing of computer programs for operating the control circuit 200 for the orienting and loading system 20, and the container handling system 140, as well as the program for the stepper motor controller 230.

BACKGROUND OF THE INVENTION**1. Field of the Invention**

The present invention relates generally to improvements in apparatus orienting articles to a proper loading orientation and for loading articles into a container. More specifically, the invention relates to the loading of pliable packages of fragile items, such as bakery goods, into containers, such as trays or baskets.

2. Description of the Prior Art

Prior product orienting and loading systems are known, one such system being disclosed in U.S. Pat. No. 4,856,263 to Schneider et al. That system reorients the product by the use of a turntable disposed beneath the upper flight of a window conveyor. Thus, the apparatus must push the product twice during the reorienting operation. First of all, the window conveyor carries or pushes the product against a stop which holds it while the window conveyor runs out beneath it to allow the product to drop through the window onto the turntable. Then, after the turntable has reoriented the product, the conveyor section of the window conveyor engages the product and pushes it off the turntable. These pushing operations can damage delicate and fragile products, such as bakery products. Furthermore, because of these pushing operations, only certain patterns of product can be accommodated on the turntable without being disturbed by the pushing operations.

The Schneider et al. system also utilizes a window conveyor in loading the product into a container. In that system the speed of the loading operation is limited by the speed of movement of the loading window conveyor.

The Schneider et al. system has a lift mechanism for lifting an empty container from a delivery conveyor to a loading position at which it is transferred to a container support for loading. Pass through of containers on the container conveyor cannot continue until the lift mechanism has been returned to its lowered position. This complicates delivery of containers to a series of orienting and loading machines stationed along the container conveyor.

SUMMARY OF THE INVENTION

It is a general object of the invention to provide an improved system for orienting and loading product, which avoids the disadvantages of prior systems while affording additional structural and operating advantages.

An important feature of the invention is the provision of apparatus for orienting product which is very gentle in handling soft and fragile products.

In connection with the foregoing feature, another feature of the invention is the provision of apparatus of

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the type set forth, which does not require pushing of the product during the orienting operation.

Another feature of the invention is the provision of a high-speed apparatus for loading product into a container.

Yet another feature of the invention is the provision of a container handling apparatus for the container loading apparatus, which minimizes interference with the conveying of containers past the apparatus on a delivery conveyor.

In connection with the foregoing feature, a further feature of the invention is the provision of an apparatus of the type set forth which includes a lift mechanism for lifting a container from the delivery conveyor and holding it in a raised position, while permitting the conveyor to continue operation.

A still further feature of the invention is the provision of a system which incorporates product orienting and loading and container handling apparatus of the type set forth.

These and other features of the invention are attained by providing product orienting apparatus comprising: conveyor means including a plurality of spaced-apart disks mounted for rotation about parallel axes and being substantially tangent to a common support plane, turntable means including a platform disposed substantially parallel to the support plane and having a plurality of slots therethrough, rotating means for rotating the platform about an axis disposed substantially perpendicular to the support plane, and lift means for moving the platform parallel to the axis between a lowered position below the support plane with the disks received through the slots and a raised position above the support plane to accommodate rotation of the platform, the slots being shaped to receive the disks therethrough in only a limited number of predetermined rotational orientations of the platform.

The invention consists of certain novel features and a combination of parts hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the details may be made without departing from the spirit, or sacrificing any of the advantages of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

For the purpose of facilitating an understanding of the invention, there is illustrated in the accompanying drawings a preferred embodiment thereof, from an inspection of which, when considered in connection with the following description, the invention, its construction and operation, and many of its advantages should be readily understood and appreciated.

FIG. 1 is a top plan view of an orienting and loading system constructed in accordance with and embodying the features of the present invention;

FIG. 2 is a front elevational view of the system of FIG. 1;

FIG. 3 is an end elevational view of the system of FIG. 1, as viewed from the left-hand end thereof;

FIGS. 4A-4C are side elevational views of the loader assembly of the system of FIG. 1, illustrating several stages of operation during the loading of a group of articles into a container;

FIG. 5 is an enlarged fragmentary top plan view of the orienting assembly of the system of FIG. 1, with portions broken away more clearly to illustrate the construction;

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FIG. 6 is a side elevational view of the orienting assembly of FIG. 5;

FIG. 7 is an end elevational view of the orienting assembly of FIG. 5;

FIG. 8 is an enlarged front elevational view of the operator interface of the system of FIG. 1;

FIG. 9 is an enlarged, top plan view of the lower elevator of the container handling assembly of the system of FIG. 1;

FIG. 10 is an end elevational view of the lower elevator of FIG. 9;

FIG. 11 is a side elevational view of the lower elevator of FIG. 10;

FIG. 12 is an enlarged top plan view of the container delivery conveyor of the system of FIG. 1;

FIG. 13 is a side elevational view of the container delivery conveyor of FIG. 12, with portions broken away more clearly to illustrate the construction;

FIG. 14 is an end elevational view of a delivery conveyor of FIG. 12;

FIG. 15 is an enlarged top plan view of the upper container elevator of the system of FIG. 1;

FIG. 16 is an end elevational view of the elevator of FIG. 15;

FIG. 17 is a view in vertical section taken along the line 17-17 in FIG. 15;

FIG. 18A-18C are a schematic circuit diagram of the control circuit for the system of FIG. 1; and

FIG. 19 is a schematic circuit diagram of the stepper motor controller of the system of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1-3, there is illustrated an orienting and loading system, generally designated by the numeral 20, constructed in accordance with the present invention. The system 20 operates for assembling a group or pattern 21 of product articles 22, orienting the pattern and then loading it into a container 25, which may be a baking pan, basket or the like. In the disclosed embodiment, the container 25 is illustrated as being a basket which includes a bottom wall 26 integral at its side edges with upstanding side walls 27 and at its end edges with upstanding end walls 28. Each of the side walls 27 and end walls 28 is preferably provided with an elongated recess 29 in the upper edge thereof centrally thereof. The container 25 may be formed of any suitable material, such as plastic, and each of the walls 27-29 may be perforated or of lattice-type construction to conserve material and weight, all in a known manner. While the principles of the present invention are operable in connection with the handling of various types of articles, for purposes of illustration, the construction and operation of the system 20 will be described in connection with the handling of soft and fragile articles, for example, articles of baked goods such as packages of sliced bread.

The orienting and loading system 20 includes an infeed assembly 30 which receives the product articles from associated equipment, such as a bagger or the like (not shown). The infeed assembly 30 includes a frame 31 having a pair of elongated, upstanding and laterally spaced-apart side panels 32 supported on a plurality of upright legs 33. The side panels 32 may be interconnected by a plurality of spaced-apart cross members (not shown) in a known manner. Carried by the frame 31 adjacent to the lower end of one of the legs 33 is a horizontal platform 34 on which is mounted a drive

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motor 35 having a reducing gear box 36 provided with an output shaft 37 carrying a sprocket which engages a drive chain 38. The drive chain 38 is, in turn, coupled to a sprocket on a drive shaft 39 extending between the side panels 32.

The infeed assembly 30 includes an infeed conveyor 40 comprising an endless conveyor belt 41 engaged with an idler roller 42 and a drive roller 43 which extend between the side panels 32 of the frame 31. The drive roller 43 is provided with a sprocket which is engaged with a drive chain 45 which is, in turn, engaged with a sprocket 46 on the drive shaft 39 to effect rotation of the infeed conveyor 40, so that the upper flight of the belt 41 moves in a direction of the arrow of FIG. 1.

The infeed assembly 30 also includes a separating conveyor 50 which is disposed adjacent to the discharge end of the infeed conveyor 40 and includes an endless belt 51 engaged around an idler roller 52 and a drive roller 53 on the drive shaft 39, so that separating conveyor 50 is directly driven by the drive chain 38. The drive shaft 39 carries an additional sprocket 53, the teeth of which are counted by a counter PX10 mounted on the frame 31 for determining the length of travel of the separating conveyor 50. The sprockets are so sized that the separating conveyor 50 runs at a higher speed than the infeed conveyor 40, so that it will tend to separate articles received from the infeed conveyor 40.

The infeed assembly 30 is also provided with a stop gate 55 disposed between the infeed and separating conveyors 40 and 50 and operable by a drive cylinder 56 for vertically reciprocating movement between a lowered position permitting free passage of articles from the infeed conveyor 40 and a raised position for stopping articles at the discharge end of the infeed conveyor 40. A stop gate 57 is also provided at the discharge end of the separating conveyor 50 and is similarly moveable between raised lowered and raised positions by a drive cylinder 58. Preferably, guide rails 59 are respectively disposed along opposite sides of the infeed assembly 30 and have outwardly flared ends at the input end of the infeed conveyor 40, for guiding articles along the infeed assembly 30.

Referring also to FIGS. 5-7, the orienting and loading system 20 also includes an orienting assembly 60 which includes a powered disk conveyor 61 disposed at the discharge end of the separating conveyor 50 for receiving article therefrom. The powered disk conveyor 61 includes a plurality of parallel shafts 62 extending between the side panels 32 and a pair of stub shafts 62a respectively extending laterally inwardly from the side panels 32 and having a length less than half the width of the conveyor 61. The inner ends of the stub shafts 62a are supported by suitable brackets coupled to adjacent ones of the shafts 62, so as to provide a central opening through the conveyor 61. Fixedly secured to each of the shafts 62 and 62a is a plurality of laterally spaced-apart disks 63, arranged so that the disks on each shaft are disposed in staggered relationship with respect to the disks on adjacent shafts, and with all of the disks 63 being tangent to a common support plane, which is substantially coplanar with the support surface of the separating conveyor 50. The drive shaft 39 carries a double sprocket 64 which is engaged with a double-stranded drive chain 65 which also engages a sprocket coupled by a clutch to a shaft 66. The chain 65 also engages sprockets on each of the shafts 62 and the adjacent one of the stub shafts 62a for effecting rotation of the disks 63 carried thereby. A drive chain 68 is jump-

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ered from a sprocket on one of the shafts 62 to a sprocket 69 on the stub shaft 62a on the far side of the disk conveyor 61 for rotating that shaft. Preferably, the sprocket sizes are such that the powered disk conveyor 61 operates at a speed slightly less than that of the separating conveyor 50.

The orienting assembly 60 also includes a turntable assembly 70 including a platform 71 which may be generally octagonal in shape and is provided with a plurality of cruciform slots 72 therethrough, dimensioned for respectively receiving the disks 63 therethrough. The platform 71 is disposed substantially parallel to the support plane of the powered disk conveyor 61 and is fixed centrally thereof to the upper end of an elongated vertical shaft 73, the lower end of which is coupled to a stepper motor 75. The shaft 73 extends through the opening in the center of the powered disk conveyor 61. The platform 71 and the stepper motor 75 are carried by a support frame 74. More specifically, the support frame 74 includes a support plate 76 which is fixed to the stepper motor 75 and is vertically movable between fixed upper and lower plates 77 and 78. Air bags 79 are disposed between the movable support plate 76 and the upper and lower plates 77 and 78, respectively.

In operation, the support plate 76 is normally disposed in a lowered position, wherein the platform 71 is disposed beneath the support plane of the powered disk conveyor 61, with the disks 63 being respectively received through the cruciform slots 72. When the lower ones of the air bags 79 are inflated, the support plate 76 and the platform 71 are lifted to a raised position wherein the platform 71 is disposed above the support plane of the powered disk conveyor 61 clear of the disks 63. In this raised position, the stepper motor 75 is operable for rotating the platform 71 about the axis of the shaft 73 among a plurality of predetermined orientations, spaced apart by substantially 90°, so that when the platform 71 is again lowered, by inflation of the upper ones and deflation of the lower ones of the air bags 79, the disks 63 will still fit through the cruciform slots 72. It will be appreciated that when the platform 71 is in its lowered position, the powered disk conveyor carries articles from the separating conveyor 50 to a position overlying the platform 71, which then lifts the articles, rotates them to reorient them, and then lowers them back onto the powered disk conveyor 61, which carries them downstream to a transfer conveyor assembly 80.

The transfer conveyor assembly 80 includes an elongated endless belt 81 which is engaged around the roller on the shaft 66 and an idler roller 82. A clutch 83 is coupled to the shaft 66 for controlling engagement and disengagement of the drive chain 65 therewith. A vertically disposed stop plate 85 overlies the support reach of the transfer conveyor belt 81 and extends transversely thereof adjacent to the idler roller 82. If desired, the stop plate 85 may be manually pivotal to a raised position to accommodate pass-through of articles from the transfer conveyor assembly 80 to auxiliary loading equipment or the like. But in normal operation of the present invention, the stop plate 85 will be disposed in a vertical stop position to prevent articles from being conveyed off the end of the transfer conveyor assembly 80.

The orienting and loading system 20 also includes a transfer pusher assembly 90 which is mounted on an extension of the frame 31 including upstanding posts 91 outboard of the transfer conveyor assembly 80 and

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extending thereabove and interconnected by cross rails 92 and side rails 93. Disposed a predetermined distance above the transfer conveyor assembly 80 and extending transversely thereof between one of the side rails 93 and a support plate 97 are a pair of parallel shafts 94, spaced apart longitudinally of the transfer conveyor assembly 80. A carriage 95 is mounted for sliding reciprocating movement longitudinally of the shafts 94. This movement is effected by an elongated rodless or band cylinder 96 which extends parallel to the shafts 94 between the support plate 97 and a side rail 93 and contains a piston (not shown) which has a coupling extending upwardly through an elongated sealed slot in the cylinder 96 and coupled to the carriage 95 for effecting movement thereof in response to pneumatic actuation of the cylinder piston. The carriage 95 carries a pusher vane 100 which depends therefrom and is mounted on a pivot shaft 101 for pivotal movement by an associated pneumatic actuator 102 between a raised or retracted position, illustrated in broken line in FIG. 3, and a lowered or pushing position, illustrated in solid line in FIG. 3. Pneumatic lines (not shown) for operating the pusher vane 100 are guided and protected in a flexible plastic chain 104 which extends from the carriage 95 and has an entry end fixed to a support bracket 106 for receiving and guiding the associated pneumatic lines (not shown).

In operation, the carriage 95 reciprocates between a retracted position illustrated to the left in FIG. 3 and an extended position illustrated to the right in FIG. 3. When the carriage 95 is in its retracted position and the pusher vane 100 is lowered to its pushing position, it terminates a very slight distance above the transfer conveyor belt 81 for engagement with the side of the pattern of articles supported thereon. As the carriage 95 advances laterally across the transfer conveyor belt 81, it pushes the articles therefrom into an associated loader assembly 110 disposed outboard of the transfer conveyor 80. A vertically extending stop plate 105 limits the lateral movement of the transferred articles. The pusher vane 100 is then retracted so as to clear any new articles which may have come onto the transfer conveyor belt 81 and the carriage 95 is then retracted.

The loader assembly 110 is supported on an extension of the frame 31 which includes upstanding posts 111 extending upwardly above the level of the infeed assembly 30 outboard thereof and interconnected by a plurality of side rails 112 and cross rails 113. A platform 114 is disposed at the top of the frame adjacent to one of the posts and supports thereon a drive motor 115 having a reduced gear box 116 with an output shaft 117 carrying a sprocket 118 engaged with a drive chain 119. The loader assembly 110 includes a window conveyor 120 which is disposed at a loading station alongside the transfer conveyor assembly 80 and substantially parallel thereto. More specifically, the window conveyor 120 includes a drive shaft 121 carrying a drive sprocket 122 engaged with the chain 119 and a clutch 123. The chain 119 also extends around an idler shaft 124 parallel to the drive shaft 121. The window conveyor 120 includes a pair of spaced-apart conveyor chains 125 engaged with sprockets on the drive shaft 121 and on an idler shaft 126, the window conveyor 120 including a conveyor section 127 comprised of a plurality of free rollers 128 extending transversely between the conveyor chains 125 and supported thereon, and a window section 129 which is devoid of rollers.

The window conveyor 120 is preferably arranged so that the upper or support flight thereof is inclined at a - 38 -

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slight angle, preferably approximately 3°, to the vertical, sloping downwardly toward its discharge end to facilitate the removal of product therefrom, as will be explained in greater detail below. Accordingly, the transfer conveyor belt 81 preferably has its support flight inclined at the same angle so as to be substantially coplanar with the support flight of the window conveyor 120 to facilitate the pushing of articles from the transfer conveyor belt 81 onto the window conveyor 120 by the transfer pusher assembly 90.

The loader assembly 110 also includes a loading pusher assembly 130 which overlies the window conveyor 120. More specifically, the loading pusher assembly 130 includes an endless conveyor including a drive shaft 131 having a sprocket 132 engaged with the chain 119 and an associated clutch 133. The chain 119 also extends around an idler sprocket 134, which may be adjustable for varying the tension of the chain 119. The pusher assembly 130 includes a pair of laterally spaced-apart conveyor chains 135 which extend around the draft shaft 131 and a tensioner 136. Equidistantly spaced apart longitudinally of the endless conveyor chains 135 and extending laterally thereacross and fixedly secured thereto are a pair of pusher paddles 137 which project outwardly of the conveyor loop. The loading pusher assembly 130 is preferably inclined at the same angle as the window conveyor 120 and is so positioned that the one of the pusher paddles 137 which is depending from the pusher conveyor terminates a very slight distance above the support flight of the window conveyor 120 for engagement with product articles supported thereon. Preferably, the window conveyor 120 also includes a discharge bar 138 which extends transversely thereacross and a slide sheet 139 which is a flexible sheet fixed at the trailing end of the conveyor section 127 between the conveyor chains 125.

Referring now also to FIGS. 4A-4C, in operation the window conveyor 120 is normally disposed in a product-receiving condition with its conveyor section 127 disposed along the upper flight for receiving articles 22 from the transfer conveyor assembly 80. An associated empty container 25 is disposed at a loading level of the loading station immediately beneath the window conveyor 120, having been moved to this location by a container handling apparatus 140 to be described more fully below. It will be appreciated that the window conveyor 120 and the endless conveyor of the loading pusher assembly 130 rotate in the same direction (counterclockwise as illustrated). Thus, it will be appreciated that the support flight of the window conveyor 120 and the lower flight of the pusher assembly conveyor will be moving in opposite directions relative to the product articles 22 supported on the window conveyor 120. The clutch 133 will be engaged a short time before the clutch 123 so that when the window conveyor 120 starts to move a pusher paddle 137 will have moved around to the trailing end of the patterns of articles 22. The window conveyor 120 will tend to move the articles 22 to the left, but the articles 22 will be engaged by the pusher paddle 137 (see FIG. 4B) to prevent such leftward movement. As the loader pusher assembly 130 continues moving, the articles 22 will be pushed to the right and the conveyor section 127 of the window conveyor 120 will move out from beneath the supported articles 22, which will then slide down the slide sheet 139 into the container 25 through the window section 129 of the window conveyor 120. In this regard, it will be appreciated that while the container 25 intersects the

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plane of the lower flight of the window conveyor 120, it is pushed out of the loading station ahead of the conveyor section 127 so as not to interfere with it. As the first article 22 enters the container 25, the discharge bar 138 on the window conveyor 120 will engage the rear end of the container 25 and will start to push the container 25 to the right, in the direction of the arrow in FIG. 4C, so that the articles 22 will be deposited side-by-side in the container 25. The discharge bar 138 will push the filled container 25 off to an associated discharge apparatus (not shown) for delivery to associated equipment such as a stacker or the like. After the window conveyor 120 and the pusher assembly 130 have completed one revolution, they will stop in their initial home positions for receiving the next group of articles 22.

Referring now also to FIGS. 12-14, the orienting and loading system 20 includes a container handling system 140 which includes a delivery conveyor 141 which carries containers 25 through the loading station at a delivery level adjacent to the lower end of the loader assembly 110 and in a direction transversely thereof. It will be appreciated that the delivery conveyor 141 may service a plurality of orienting and loading systems 20 arranged generally side-by-side. The delivery conveyor 141 includes a pair of laterally spaced-apart and substantially parallel guide rails 142 disposed for respectively supporting opposite end edges of associated containers 25. Disposed between the guide rails 142 are a pair of conveyor belts 143, the support flights thereof being parallel to the guide rails 142 and substantially at the level thereof. The conveyor 141 includes a stop plate 144 which is pivotally movable by an associated pneumatic actuator 145 between a lowered retracted position accommodating movement of containers 25 along the conveyor 141 and a raised stop position blocking passage of containers 25 along the conveyor 141 at the exit end of the loading station. The conveyor 141 is also provided with an overhead frame 146 upstream of the stop plate 144 which carries a pivoting stop plate 147 which is movable by an associated pneumatic actuator 148 between a raised position, accommodating passage of containers 25, and a depending, substantially vertically disposed stop position for blocking the passage of containers 25 along the conveyor 141.

Referring also to FIGS. 9-11, the container handling system 140 also includes a lower container elevator 150, which includes two pairs of lifters 151 respectively disposed on opposite sides of the delivery conveyor 141. Each of the lifters 151 is mounted for pivotal movement about a pivot shaft 152 between an extended lifting position and a retracted position, each pair of lifters 151 being carried by an associated one of a pair of mounts 153, respectively fixedly secured to drive chains 154. Each of the drive chains 154 extends along an endless path defined in part by a plurality of sprockets 155 carried by a vertical mounting plate 156 disposed at the adjacent side of the delivery conveyor 141. Each chain 154 is connected to an associated rotary actuator 157 which operates to move the chains 154 back and forth along the loops for moving the lifters 151 vertically among a delivery level at the level of the delivery conveyor 141, a standby level a slight distance above the delivery level, and an access level above the standby level and just below the loading level. The rotary actuator 157 includes a pinion disposed in meshing engagement with a pair of racks, each having its opposite ends respectively coupled to two air cylinders. By selective

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pressurizing of the various cylinder ports, the actuator may be moved among a number of predetermined positions. The actuator may be of the type sold by PHD, Inc. under the designation "6000 Series". The pinion drives a shaft 158 which spans the delivery conveyor 141 and carries sprockets 159 respectively engaged with the chains 154 for driving them.

Referring also to FIGS. 15-17, the container handling system 140 also includes an upper elevator 160 disposed immediately above the elevator 150 and including a pair of lifting bars 161, respectively disposed along opposite sides of a container 25 supported by the lower elevator 150. Each of the lifting bars 161 is mounted on an associated pivot joint 162 carried by an associated support 163 for pivotal movement between an extended lifting position and a raised retracted position. The elevator 160 includes two pairs of vertical guide posts 164 respectively disposed at opposite sides of the window conveyor 120 immediately therebeneath on support frames 164a and in guiding engagement with the associated support 163. Each support carries a pair of horizontally extending and vertically spaced-apart cam follower rails 165. Each pair of cam follower rails 165 has a cam roller 166 disposed therebetween for rolling engagement therewith, each cam roller 166 being carried by a cam arm 167 extending radially of an associated sprocket 168. The sprockets 168 are respectively engaged with a pair of endless drive chains 170, each of which also engages a drive shaft 171 operated by a rotary actuator 173. The cam arms 167 are respectively fixed to the drive chains 170 for movement therewith.

It will be appreciated that, as the drive chains 170 are rotated back and forth, the cam arms 167 are pivoted through about 180° around the sprockets 168 between a raised position, illustrated in solid line in FIG. 17 and a lowered position illustrated in broken line in FIG. 17, thereby carrying the cam follower rails 165 and the lifting bars 161 between raised and lowered positions. The lowered position of the lifting bars 161 is at the access level of the elevator 150. Thus, it will be appreciated that the elevator 160 can pick up a container 25 being supported on the elevator 150 at the access level and raise it to the raised position, which corresponds to the loading level for receiving product articles 22 from the loader assembly 110, as described above.

It is a significant aspect of the invention that, because the container handling system 140 includes two elevators 150 and 160, when a container 25 is being carried by the upper elevator 160, the lower elevator 150 is free to move among its several levels for acquiring another container. Similarly, the multiple positions of the elevator 150 permit a container to be lifted from the delivery conveyor 141 to a standby level, thereby permitting additional containers 25 to pass through the loading station on the delivery conveyor 141 to other downstream equipment. This minimizes interruption of the flow of containers along the delivery conveyor 141 if it is servicing more than one orienting and loading system 20. It also serves to greatly speed the container loading operation, since at least one container can always be ready in the standby position while another is being loaded.

Referring also to FIG. 8, control of the orienting and loading system 20 is conducted from an operator interface 180 which may include a video screen 181 and an associated keyboard 182 and associated control switches. It is a significant aspect of the invention that

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the operation of the orienting and loading system 20 is controlled by a programmable logic controller including a processor operating under stored program control, interaction between the operator and the processor being conducted through the operator interface 180.

Referring now to FIGS. 18A-18C, the control circuit 200 for the orienting and loading system 20 will be described. The motors 35 and 115, which respectively drive the infeed assembly 30 and the loader assembly 110, are driven from a suitable AC supply, such as a 575-volt, three-phase, 60 Hz. supply, through a main disconnect switch 201, motor starter protect switches 202 and starter contactors 203. The primary of a control transformer 204 is connected across one phase of the three-phase supply and steps the voltage down to 115 VAC, the secondary of the transformer 204 being connected across 115 VAC lines 205 and 206. It will be appreciated that suitable fusing (not shown) may be provided in the three-phase circuit and in the 115 VAC circuit. Connected across the secondary of the control transformer 204 is the primary of a constant voltage transformer 207, across the secondary of which are connected in parallel a power supply 208 for the processor of the programmable logic controller and a power supply 209 for the operator interface 180. The programmable controller may be any of a number of different types of commercially available controllers. The disclosed system uses a controller sold by Texas Instruments Company under the designation 525-1104. Other controllers may require different AC supply arrangements. The controller is provided with input and output terminal modules, including a DC input module 226, an AC output module 227, an AC input module 228 and an AC output module 229. Associated with each terminal of these modules is a five-digit number designating the software address of the function associated with that terminal. Input terminal addresses begin with the letter "X" while output terminal addresses begin with the letter "Y".

Connected across the secondary of the control transformer 204 is the coil of a interlock relay XR. Connected in parallel with the XR relay coil is the series connection of a normally-closed push button power down switch 210, a normally-open push button power up switch 211 and a power on indicator lamp 212. The coil of a master control relay MCR is connected in parallel with the lamp 212 and its normally-open contacts MCR-2 are connected in parallel with the power up switch 211 for latching the circuit in an energized condition in response to momentary closure of the switch 211. Also connected in parallel with the lamp 212 is a 24-VDC supply 213 which provides a 24-VDC output voltage across a -DC line 214 and a +DCL line 215. The line 206 of the 115 VAC supply is connected through the normally-open contacts MCR-1 of the master control relay MCR to one normally-open pole of a three-pole push button emergency stop switch 216. The other fixed contact of that pole is connected through a lamp 217 to the common line 203 and to a line 218, discussed more fully below. The normally-open pole of the switch 216 is connected by a jumper 219 to a fixed contact of a normally-closed pole, the other contact of which is connected through a surge suppressor 220 to the common line 205. The third pole of the switch 216 is also normally-closed, and has one fixed contact thereof connected to the +DCL line 215 and the other fixed contact thereof connected to a line 221 to be discussed further below. The junction between the

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surge suppressor 220 and the emergency stop switch 216 is connected to an AC supply line 222.

It will be appreciated that when the power up switch 211 is closed, the control circuit 200 is powered up. If it is desired to shut the system down, the power down switch 210 is actuated to remove the AC voltage from the 24-VDC supply 213 and to reopen the relay contacts MCR-1 to remove the AC supply voltage from the remainder of the circuitry.

The -DC supply line 214 is connected to the DC input terminal module 226 of the programmable controller. Respectively connected in parallel between the +DCL line 215 and corresponding DC input terminals of the controller are proximity switches PX10-PX13 and PX21-PX24. Also connected in parallel between the +DCL line 215 and corresponding DC input terminals of the controller are a guard switch 223, normally-open contacts MRA-1 and MRB-1, respectively, of an infeed motor starter MRA and loader motor starter MRB, and the contacts of a solid state relay SSR8. Also connected in parallel across the DC supply lines 214 and 215 are reflector-type photo eyes PE10, PE12, PE33 and PE34, the receiver terminals of which are respectively connected to corresponding DC input terminals of the controller. Also connected in parallel across the DC supply lines 214 and 215 are the emitter and receiver of a photo eye PE11, the receiver of which is connected to a corresponding DC input terminal of the controller.

The AC supply line 222 is connected to the AC output terminal modules 227 and 229, while the AC supply common line 205 is connected to the AC input terminal module 228. The motor starter MRA for the infeed motor 35 and its contacts MRA-2 are connected in series between the AC line 205 and a corresponding AC output terminal of the controller. Similarly, the motor starter MRB for the drive motor 115 and its contacts MRB-2 are connected in series between the line 205 and a corresponding AC output terminal of the controller. The contacts MRA-2 and MRB-2 are normally open contacts, but they are closed whenever the motor circuit protector switches 202 are closed and are, therefore, illustrated as closed in FIG. 18B. An alarm horn 224 and an alarm beacon 225 are connected between the line 218 from the emergency stop switch 216 and corresponding AC outputs of the controller. Respectively connected between corresponding AC outputs of the processor and the AC line 205 are coils of a need basket relay NBR and a basket lifted relay BLR, and the actuators of solid state relays SSR1, SSR2, SSR3, SSR5, SSR6 and SSR7. Also connected between the AC line 205 and corresponding AC output terminals of the controller are solenoid valves SV10-SV13 and SV20-SV23 and SV1-SV7. Connected between the AC line 222 and corresponding AC input terminals of the controller are photo eyes PE1-PE3 and proximity switches PX1-PX7. Also connected in series between the line 222 and one of the AC input terminals of the controller are the normally-open contacts XR-2 of the interlock relay XR and the normally-open contacts MRB-3 of the motor starter MRB. Also connected in series between the line 222 and the corresponding AC input terminal of the controller are the normally-open contacts XR-3 of the interlock relay and the normally-open contacts NBR-1 of the need basket relay NBR.

Referring to FIG. 19, the stepper motor 75 is provided with a controller 230 which has its own internal software. This controller has connector sockets J4, J5,

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and J6 which receive mating connectors, the connector J5 being connected to the terminals of the stepper motor 75, the connector J6 being connected to the ground terminal and the AC lines 222 and 205 and the connector J4 being connected to the contacts of the solid state relays SSR1-SSR7 and to the actuator of the relay SSR8. The contacts of the relay SSR8 are connected across the DCL line 215 and a DC input terminal of the controller, as can also be seen in FIG. 18A. The actuator of the solid state relay SSR4 is connected across the -DC line 214 and the line 233 (see FIG. 18A). The actuators of the other solid state relays are connected between the AC line 205 and corresponding AC output terminals of the processor, as was described above in connection with FIG. 18B.

The signals from the controller AC output terminals connected to the solid state relays SSR5-SSR7 serve to select the particular program routine of the stepper controller 230 which corresponds to a preselected rotation of the turntable platform 71 for orienting the product articles 22. The stepper motor 75 will be operable only when the controller start relay SSR1 and the master stepper control relay SSR3 are actuated and the turntable platform 71 is in its raised position, as indicated by a signal to the relay SSR4. Whenever the turntable is in a rotating routine, a busy signal will appear at the relay SSR8 to prevent initiation of a further rotation program. A stop signal from the controller to the relay SSR2 will cause the stepper motor 75 to stop.

It is believed that the operation of the control circuit 200 and the stepper controller 230 in conjunction with the associated program software set forth in the Microfiche Appendix will be readily understood by those skilled in the art. However, there follows a simplified explanation of the overall operation of the orienting and loading system 20, with reference to the control circuit 200 and the stepper controller 230. To operate the orienting and loading system 20, the main disconnect switch 201 must be closed. This provides power to the operator interface 180 via the power supply 209 and to the system processor via the power supply 208. When the power up switch 211 is closed, it is latched through the contacts MCR-2 of the master control relay MCR, the lamp 212 being illuminated to indicate that power is on. This energizes the 24-VDC supply 213 for supplying DC power to the programmable controller, while closure of the relay contacts MCR-1 provides AC power to the programmable controller via the AC line 222 through the emergency stop switch 216. The system 20 is now ready for the operator to select product information via the operator interface 180. In this regard, a product selection screen will appear on the video monitor 181, instructing the operator to select the product pattern to load via the keyboard 182. Once a product pattern is selected, all the designated timing and counting registers are loaded from product storage registers into sequencer registers in the processor software. The operator has the choice of running a fixed number of articles or running continuously until a new product pattern is selected. After the choice has been made the start up screen is displayed and the system 20 is ready to run.

When the motor circuit protector switches 203 are enabled, the drive motors 35 and 115 for the infeed assembly 30 and the loader assembly 110 can be started by the operator from the keyboard 182. More specifically, the processor outputs AC signals at addresses Y0017 and Y0018 to the starters MRA and MRB, which

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close their contacts MRA-1 and MRB-1 to provide DC input signals to the processor at addresses X0013 and X0014. The infeed conveyor 40, the separating conveyor 50 and the powered disk conveyor 61 all begin operating and the loader assembly 110 is enabled.

Each time a product article 22 blocks the infeed photo eye PE10, it inputs a DC signal to the processor at address X0034. The infeed motor 35 will shut off and dwell if the photo eye PE10 is not blocked by product for a predetermined time period, and will restart when the photo eye PE10 is again blocked. Normally, the stop gate 55 is lowered. Thus, as product passes onto the separating conveyor 50, its higher speed creates a separation between product articles 22. At this transfer to the separating conveyor 50, the product articles 22 are counted by the count photo eye PE11, which inputs DC signals to the processor at address X0035 to increment a software counter.

The articles traveling along the separating conveyor 50 are stopped by the stop gate 57, which is normally closed. When the article counter has reached a predetermined count an AC signal will be output to the solenoid valve SV10 at address Y0023 to actuate the drive cylinder 56 and raise the stop gate 55 to hold back additional articles 22 until the previous group of articles 22 is advanced past the stop gate 57.

If the turntable platform 71 is in its lowered position, it will actuate the proximity sensor PX12 to input a DC signal to the processor at address X0003. If this occurs when the stop gate 55 is raised, the processor outputs an AC signal at address Y0026 to the solenoid valve SV11 to cause the drive cylinder 58 to lower the stop gate 57, allowing the assembled articles to pass from the separating conveyor 50 to the powered disk conveyor 61.

The infeed conveyor position counter proximity sensor PX10 is mounted near the drive shaft 39 for counting the teeth of the sprocket 53, each sprocket tooth causing a DC signal to the input of the controller at address X0001 for incrementing a number of software counters. When one counter has reached a predetermined value after lowering of the stop gate 57, the processor will output an AC signal at address Y0024 to the solenoid valve SV10 to lower the stop gate 55 and allow additional articles to pass onto the infeed conveyor 40.

The proximity sensor PX10 will increment counters for each of the several areas of the infeed assembly 30. When a counter corresponding to the powered disk conveyor 61 has reached a predetermined count after lowering of the stop gate 57, this will indicate that the articles on separating conveyor 50 should have passed completely onto the powered disk conveyor 61. This will cause the processor to output an AC signal at address Y0025 to the solenoid valve SV11 to raise the stop gate 57 back to its normal stop position. It will also output an AC signal at address Y0027 to the solenoid valve SV12 to cause the lower air bags 79 of the turntable 70 to be inflated to raise the platform 71, lifting the articles 22 a slight distance above the powered disk conveyor 61. When the platform 71 reaches its raised position, it actuates the proximity sensor PX11 to input a DC signal to the processor at address X0002. This will cause the processor to output AC signals to solid state relays SSR1-SSR3 and SSR5-SSR7 at addresses Y0053-Y0058 for actuating the stepper motor 75 through the stepper motor controller 230 (FIG. 19) to index the platform 71 through the required rotation to orient the articles 22 to the selected pattern. The stepper controller

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230 is programmed so that the platform 71 can rotate bidirectionally in any 90° or 180° increment. During the stepper drive cycle, a turn in progress signal is sent to the processor at address X0033 to prevent the platform 71 from being lowered.

Once the turntable assembly 70 has completed its cycle, the processor will output an AC signal at address Y0028 to the solenoid valve SV12 for deflating the lower air bags 79 and inflating the upper air bags 79 to lower the platform 71, returning the articles to the powered disk conveyor 61. Since the turntable assembly 70 can rotate in only 90° or 180° increments, the disks 63 will still fit through the cruciform slots 72 to permit return of the platform 71 to its lowered position. In its lowered position, the platform 71 will actuate the proximity switch PX13 to input a DC signal to the processor at address X0011.

When the articles 22 have been returned to the powered disk conveyor 61, it will convey them from the orienting assembly 60 to the transfer conveyor assembly 80. As the articles block the photo eye PE12 at the exit of the orienting assembly 60, it will then input a DC signal to the processor at address X0036 causing it to output an AC signal at address Y0029 to the solenoid valve SV13 for engaging the clutch 83 on the drive shaft 66 to start the transfer conveyor belt 81. The transfer conveyor assembly 80 will run until the photo eye PE12 is cleared, if the pattern of articles is to be combined with another pattern before being pushed onto the loader assembly 110. If the pattern is not to be combined with another pattern, the transfer conveyor assembly 80 will run until a predetermined position count value has been reached in response to counter proximity sensor PX10. The stop plate 85 will prevent the articles from falling off the end of the transfer conveyor belt 81.

When the transfer conveyor assembly 80 has stopped, the processor will output a push signal at address Y0030 to the solenoid valve SV20 for actuating the transfer pusher assembly 90, if the window conveyor 120 and the loading pusher assembly 130 are in their home positions, as indicated by DC signals being input to the processor at addresses X0007 and X0008 from the proximity switches PX23 and PX24, respectively. These home positions are illustrated in FIG. 4A. The pusher vane 100 will normally be disposed in its extended pushing position. The push signal will cause the cylinder 96 to be actuated to extend the carriage 95 and push the pattern of articles 22 laterally from the transfer conveyor belt 81 onto the conveyor section 128 of the window conveyor 120. When the carriage 95 has reached its fully extended position, illustrated in solid line in FIG. 3, it will actuate the proximity sensor PX21 to input a DC signal to the processor at address X0005. If the processor is calling for a load cycle, the transfer pusher assembly 90 will remain in its extended position until the loading pusher assembly 130 is moved from its home position.

If a load cycle is not being called for, such as if the system is set to push two patterns of articles onto the loader assembly 110 before loading into a container, the transfer pusher assembly 90 will retract. More specifically, the processor will output an AC signal at address Y0049 to the solenoid valve SV21 for causing the actuator 102 to rotate the pusher vane 100 up to its retracted position, illustrated in broken line in FIG. 3, and then an AC signal at address Y0031 to the solenoid valve SV20 will cause the cylinder 96 to retract the carriage 95. In its retracted position, the pusher vane 100 will clear any

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additional product articles 22 which have come onto the transfer conveyor assembly 80. When the transfer pusher assembly 90 is fully retracted, it actuates the proximity switch PX22 to input a DC signal to the processor at addresses X0006, causing it to output a signal at address Y0049 to the solenoid valve SV21 for rotating the pusher vane 100 back down to its extended pushing position.

A load cycle can begin when the transfer pusher assembly 90 is fully extended, as indicated by proximity switch PX21, a container 25 is present at the loading level, as indicated by photo eye PE33 inputting a DC signal to the processor at address X0037, and a load sequencer bit is enabled in software indicating the necessary pattern or patterns of articles have been transferred onto the loader assembly 110. At this point, the processor will output an AC signal at address Y0051 to actuate the solenoid valve SV22 for engaging the clutch 133 of the pusher assembly drive shaft 131 for starting the pusher assembly 130. After a predetermined time delay, which starts when the loading pusher assembly 130 leaves its home position, as sensed by proximity sensor PX23, for inputting a DC signal to the processor at address X0007, the processor will output an AC signal at address Y0052 to actuate the solenoid valve SV23, for engaging the window conveyor drive shaft clutch 123 to start the window conveyor 120.

As was described above, the window conveyor 120 and the loading pusher assembly 130 work together, the pusher paddle 137 advancing the articles 22 toward the discharge end of the window conveyor 120, while the window section 129 of the window conveyor 120 runs out from under the articles 22 in the opposite direction, allowing the articles to pass through the window section 129 into the container 25, as the discharge bar 138 advances the container 25 toward the discharge of the system. The window conveyor 120 and the loading pusher assembly 130 continue to rotate through one complete revolution until they return to their home positions, at which point the proximity switches PX23 and PX24 input DC signals to the processor at addresses X0007 and X0008 to disengage the clutches 123 and 133. If either of the proximity switches PX23 and PX24 is not actuated within a predetermined time period after start of the product load cycle, a "jam fault" or a "loader belt jam" message will be displayed on the video monitor 181 of the operator interface 180.

Referring in particular to FIGS. 12-14 and 18C, the container handling system 140 delivers containers 25 to the loading station along the delivery conveyor 141. When a container is stopped at the loading station it will block the photo eye PE3, which will input an AC signal to the processor at address X0068. In this condition, when a container is required by the loader assembly 110, the processor will output signals at addresses Y0086, Y0087 and Y0090 to the solenoid valves SV1-SV3 for actuating the rotary actuator 157 to raise the container elevator 150 from its delivery level to its standby level. In this regard, the lifters 151 will engage the bottom wall 26 of the container 25 along the opposite ends thereof. When the container 25 reaches the standby level, it will actuate the proximity sensor PX2 to input an AC signal to the processor at address X0075. When the container is lifted from the delivery position, clearing the photo eye PE3, the processor will output an AC signal at address Y0095 to the solenoid valve SV6 to raise the stop plate 147 to its release position to allow the next container to pass through to the stop

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plate 144 at the loading station. As soon as the container which had been held by the stop plate 147 is released, it will clear the photo eye PE2 as long as there is no following basket in abutting engagement with it. This clearance will remove an AC signal from the processor at address X0067, causing an output signal at address Y0096 to the solenoid valve SV6 for reclosing the stop plate 147. Normally, the next basket will be following sufficiently closely behind that the stop plate 147 will drop inside of it to its closed position for engaging the inside surface of the trailing wall of the container. If the container which is released from the stop plate 147 is abutting the following container, the photo eye PE2 will not be cleared. In this case, the processor will reclose the stop plate 147 a predetermined time period after it is opened such that it will stop the following container. Thus, the stop plate 147 will maintain a spacing between the container and the loading station and following containers.

The stop plate 144 at the loading station will remain closed unless a downstream orienting and loading system 20 sends a signal indicating that it requires containers. In that event, the processor will output an AC signal at address Y0094 to the solenoid valve SV5 for opening the stop plate 144. It will remain open until the downstream need is filled, at which point the processor will output a signal at address Y0093 to the solenoid valve SV5 for closing the stop plate 144. Stop plate 144 will lower if a downstream orienting and loading system 20 requires a container.

After a loaded container has been discharged from the loader assembly 110, as described above, the proximity sensor PX4 will be cleared, signalling that another empty container is needed at the loading level. The processor will respond by outputting signals to the solenoid valves SV1-SV3, causing the container elevator 150 to raise the next container 25 from the standby level to the access level, where the proximity sensor PX3 is closed, inputting an AC signal to the processor at address X0076. The processor responds by outputting an AC signal at address Y0092 to the solenoid valve SV4 for lowering the upper elevator 160 from its raised position at the loading level to its lowered position at the access level by actuating the drive cylinder 173. During this movement, the lifting bars 161 will pivot upwardly as they engage the container supported on the elevator 150 and will then snap back to their extended lifting positions as they pass below the container. When the elevator 160 reaches its lowered position, it actuates the proximity sensor PX5 to input an AC signal to the processor at address X0078, causing an output signal at address Y0091 to the solenoid valve SV4 for raising the elevator 160 back to its raised position, lifting the container to the loading level, at which point the proximity sensor PX4 is again actuated. The container is now ready to be loaded. The solenoid valves SV1-SV3 are then again actuated to return the elevator 150 to its lowermost position at the delivery level. During this movement, the lifters 151 will pivot upwardly as they engage the next container at the loading station on the delivery conveyor 141 and will snap back to their extended lifting positions as they pass below the container. When the elevator 150 reaches the delivery level the proximity sensor PX1 is actuated to again energize the solenoid valves SV1-SV3 to raise the container from the delivery conveyor 141 to the standby level.

In the event of an emergency the orienting and loading system 20 can be shut down by actuation of the

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emergency stop switch 216. The closure of the normally-open pole will energize the emergency lamp 217 and the emergency alarm horn 224 and beacon 325. The opening of the normally-closed poles will disconnect the DC and AC supply voltages from the controller. It will be appreciated that the system 20 could also be stopped by actuating the power down switch 210, which deenergizes the 24 VDC supply 213 and deenergizes the master control relay MCR for opening the AC supply at the contacts MCR-1.

From the foregoing, it can be seen that there has been provided an improved product orienting and loading system which provides orienting of product without pushing thereof, provides rapid loading of the product into containers and provides effective supply of containers to the loading system without interrupting the supply to adjacent systems.

We claim:

1. Product orienting apparatus comprising: conveyor means including a plurality of spaced-apart disks mounted for rotation about parallel axes and being substantially tangent to a common support plane, turntable means including a platform disposed substantially parallel to said support plane and having a plurality of slots therethrough each cruciform in shape, rotating means for rotating said platform about an axis disposed substantially perpendicular to said support plane, and lift means for moving said platform parallel to said axis between a lowered position below said support plane with said disks received through said slots and a raised position above said support plane to accommodate rotation of said platform, said slots being shaped to receive said disks therethrough in only a limited number of predetermined rotational orientations of said platform spaced substantially 90° apart.

2. The apparatus of claim 1, wherein said rotating means includes a stepper motor.

3. The apparatus of claim 1, and further comprising frame means for supporting said rotating means and said turntable means, said lift means including means for raising and lowering said frame means.

4. Apparatus for loading product into a container comprising: support means for holding a container in a loading position, endless loading means overlying the loading position for movement along an endless path and including a conveyor section for supporting product and a window section for allowing product to drop therethrough, transfer means for moving product onto said conveyor section, shifting means engageable with the product when it is supported on said conveyor section of said loading means, and motive means for respectively moving said loading means and said shifting means in opposite directions relative to the product to shift the product from said conveyor section through said window section and into a container supported in the loading position.

5. The apparatus of claim 4, and further comprising means for moving the container in a discharge direction during shifting of the product thereinto from said conveyor section.

6. The apparatus of claim 5, wherein said means for moving a container is carried by said endless loading means.

7. The apparatus of claim 4, wherein said shifting means includes a pusher member engageable with the product at one end thereof.

8. The apparatus of claim 4, wherein said shifting means includes means movable along an endless path.

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9. The apparatus of claim 8, wherein said shifting means overlies said loading means and causes the product to move relative to said loading means so that said conveyor section moves out from beneath the product.

10. The apparatus of claim 8, wherein each of said loading means and said shifting means moves once around its endless path during the shifting of product from said conveyor section into a container.

11. Apparatus for loading product into a container at a loading level of a loading station comprising: container supply means for delivering a container to the loading station at a delivery level spaced substantially vertically from the loading level, first elevator means at the loading station for moving a container from the delivery level to an access level intermediate the delivery and loading levels, second elevator means at the loading station for moving a container from the access level to the loading level, and loading means at the loading station for loading product into the container at the loading level.

12. The apparatus of claim 11, wherein said first elevator means includes means for moving the container to a standby level intermediate the delivery and access levels.

13. The apparatus of claim 11, and further comprising discharge means for moving the loaded container from the loading station.

14. The apparatus of claim 11, wherein the loading level is disposed above the delivery level.

15. The apparatus of claim 11, wherein each of said first and second elevator means includes a plurality of lifters engageable with a container along opposite sides thereof.

16. The apparatus of claim 15, wherein each of said lifters includes means accommodating pivotal movement thereof between an extended position for lifting engagement with the container and a retracted position accommodating movement past the container.

17. Apparatus for orienting a product and loading the product into a container at a loading level of a loading station, said apparatus comprising: conveyor means including a plurality of spaced-apart disks mounted for rotation about parallel axes and being substantially tangent to a common support plane, turntable means including a platform disposed substantially parallel to said support plane and having a plurality of slots therethrough, rotating means for rotating said platform about an axis disposed substantially perpendicular to said support plane to orient the product, lift means for moving said platform parallel to said axis between a lowered position below said support plane with said disks received through said slots and a raised position above said support plane to accommodate rotation of said platform, said slots being shaped to receive said disks therethrough in only a limited number of predetermined rotational orientations of said platform, transfer means for moving the oriented product from said turntable means to the loading station, container supply means for delivering a container to the loading station at a delivery level spaced substantially vertically from the loading level, first elevator means at the loading station for moving a container from the delivery level to an access level intermediate the delivery and loading levels, second elevator means at the loading station for moving a container from the access level to the loading level, endless loading means overlying the loading level for movement along an endless path and including a conveyor section for supporting product and a window

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section for allowing product to drop therethrough, said transfer means including means for moving oriented product onto said conveyor section, shifting means engageable with the product when it is supported on said conveyor section of said loading means, and motive means for respectively moving said loading means and said shifting means in opposite directions relative to the product to shift the product from said conveyor section through said window section and into a container supported at the loading level.

18. The apparatus of claim 17, wherein said first elevator means includes means for moving the container to

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a standby level intermediate the delivery and access levels.

19. The apparatus of claim 18, wherein the loading level is disposed above the delivery level.

20. The apparatus of claim 17, wherein the predetermined rotational orientations of said platform are spaced substantially 90° apart, each of said slots being substantially cruciform in shape.

21. The apparatus of claim 17, wherein said shifting means includes means movable along an endless path.

22. The apparatus of claim 21, wherein said endless loading means includes means for moving the container in a discharge direction during shifting of the product thereto from said conveyor section.

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PATENTABILITY

2131.01

use multiple references in a 35 U.S.C. 102 rejection. See MPEP § 2131.01.

2131.01 Multiple Reference 35 U.S.C. 102 Rejections

Normally, only one reference should be used in making a rejection under 35 U.S.C. 102. However, a 35 U.S.C. 102 rejection over multiple references has been held to be proper when the extra references are cited to:

(A) Prove the primary reference contains an "enabled disclosure;"

(B) Explain the meaning of a term used in the primary reference; or

(C) Show that a characteristic not disclosed in the reference is inherent.

See paragraphs I-III below for more explanation of each circumstance.

I. TO PROVE REFERENCE CONTAINS AN "ENABLED DISCLOSURE"

Extra References and Extrinsic Evidence Can Be Used To Show the Primary Reference Contains an "Enabled Disclosure"

When the claimed composition or machine is disclosed identically by the reference, an additional reference may be relied on to show that the primary reference has an "enabled disclosure." *In re Samour*, 571 F.2d 559, 197 USPQ 1 (CCPA 1978) and *In re Donohue*, 766 F.2d 531, 226 USPQ 619 (Fed. Cir. 1985) (Compound claims were rejected under 35 U.S.C. 102(b) over a publication in view of two patents. The publication disclosed the claimed compound structure while the patents taught methods of making compounds of that general class. The applicant argued that there was no motivation to combine the references because no utility was previously known for the compound and that the 35 U.S.C. 102 rejection over multiple references was improper. The court held that the publication taught all the elements of the claim and thus motivation to combine was not required. The patents were only submitted as evidence of what was in the public's possession before applicant's invention.).

II. TO EXPLAIN THE MEANING OF A TERM USED IN THE PRIMARY REFERENCE

Extra References or Other Evidence Can Be Used to Show Meaning of a Term Used in the Primary Reference

Extrinsic evidence may be used to explain but not expand the meaning of terms and phrases used in the reference relied upon as anticipatory of the claimed subject matter. *In re Baxter Travenol Labs.*, 952 F.2d 388, 21 USPQ2d 1281 (Fed. Cir. 1991) (Baxter Travenol Labs. invention was directed to a blood bag system incorporating a bag containing DEHP, an additive to the plastic which improved the bag's red blood cell storage capability. The examiner rejected the claims over a technical progress report by Becker which taught the same blood bag system but did not expressly disclose the presence of DEHP. The report, however, did disclose using commercial blood bags. It also disclosed the blood bag system as "very similar to [Baxter] Travenol's commercial two bag blood container." Extrinsic evidence (depositions, declarations and Baxter Travenol's own admissions) showed that commercial blood bags, at the time Becker's report was written, contained DEHP. Therefore, one of ordinary skill in the art would have known that "commercial blood bags" meant bags containing DEHP. The claims were thus held to be anticipated.).

III. TO SHOW THAT A CHARACTERISTIC NOT DISCLOSED IN THE REFERENCE IS INHERENT

Extra Reference or Evidence Can Be Used To Show an Inherent Characteristic of the Thing Taught by the Primary Reference

"To serve as an anticipation when the reference is silent about the asserted inherent characteristic, such gap in the reference may be filled with recourse to extrinsic evidence. Such evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill." *Continental Can Co. USA v. Monsanto Co.*, 948 F.2d 1264, 1268, 20 USPQ2d 1746, 1749 (Fed. Cir. 1991) (The court went on to explain that "this modest flexibility in the rule that 'anticipation'

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which obligate the Government to an expenditure of funds....

Similarly, 41 C.F.R. § 1.209 (1983) defines "procurement" as

the acquisition ... from non-Federal sources, of personal property and non-personal services (including construction) by such means as purchasing, renting, leasing (including real property), contracting or bartering, but not by seizure, condemnation, donation, or requisition.

Here there was no "buyer" or "seller" and no obligation on the part of the Government to expend funds. The Claims Court noted that "a cash 'payment' is not the applicable test" of whether a contract comes within the ambit of the CDA. See *Coffey v. United States On Behalf Of The Commodity Credit Corp.*, 626 F.Supp. 1246, 1250 (D.Kan.1986). We are persuaded, however, that the transaction here was closer to being donative in nature than it was to the contracts for procurement of property or services which Congress contemplated including within the scope of the Contract Disputes Act.

We are also not convinced that the transaction was a "barter" contract as found by the Claims Court to support its holding that the CDA was applicable. The September 23, 1988 document merely conditioned acceptance of the LAV virus samples on a promise to refrain from sharing them without permission from Pasteur. Neither that promise nor the Government's implied promise to share the results of future experiments with Pasteur can be considered "specific property susceptible of valuation," as would be required for barter. Black's Law Dictionary 1200 (5th ed. 1979).

Finally, application of complex, burdensome, and inevitably time-consuming procurement regulations to the type of scientific collaboration here involved would "not do justice to the realities of the situation." *Texas State Comm'n For The Blind*, 796 F.2d at 406. The exchange of information and perishable biological products among scientists engaged in collaborative research relating to deadly diseases such as AIDS should not be required to await compliance with procurement regulations such as

those requiring a documented determination by a contracting officer that the contractor (here, Pasteur) is "responsible," 41 C.F.R. §§ 1-1.12, 3-1.12 (1983), or a written justification for contracting on a noncompetitive basis, 41 C.F.R. § 3-3.5301 (1983). Moreover, the numerous form clauses required by federal procurement regulations would have no applicability to this type of collaborative research effort. See, e.g., 41 C.F.R. §§ 1-1.318-7, 1-7 (1988). Confirmatory of this is the fact that HHS itself has used a form similar to Pasteur's September 23, 1988 agreement when sending cell lines to other laboratories.

For the foregoing reasons, we are persuaded that the primary function of the pleaded contracts was facilitation of the transfer of research materials among scientists engaged in a collaborative research effort, not procurement of property or services, and that they, therefore, do not fit within the scope of the Contract Disputes Act. Accordingly, we reverse the judgment of the Claims Court and remand the case for consideration of whether there is a valid and enforceable contract, and, if so, whether it has been breached.

REVERSED and REMANDED.



VERDEGAAL BROTHERS, INC.,
William Verdegaaal, George
Verdegaaal, Appellees,

v.

UNION OIL COMPANY OF CALIFORNIA, Brea Agricultural Services, Inc., Appellants.

Appeal No. 86-1258.

United States Court of Appeals,
Federal Circuit.

March 12, 1987.

Action was instituted for alleged patent infringement. The United States Dis-

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Cite as 514 F.2d 628 (Fed. Cir. 1987)

trict Court for the Eastern District of California, Robert E. Coyle, J., entered judgment on verdict for plaintiff, declaring patent valid and infringed, and defendants appealed. The Court of Appeals, Nies, Circuit Judge, held that patent relating to a process for making urea-sulfuric acid liquid fertilizer by reacting water, urea, a nitrogen-containing chemical, and sulfuric acid, a sulfur-containing chemical, in particular proportions was anticipated by prior art reference disclosing processes for making both urea-phosphoric acid and urea-sulfuric acid fertilizers and was invalid.

Reversed.

See also, Fed. Cir., 750 F.2d 947.

1. Federal Civil Procedure §2609

A district court presented with a motion for judgment notwithstanding the verdict should consider all of the evidence, in a light most favorable to nonmoving party, drawing all reasonable inferences favorable to that party, without determining credibility of witnesses, and without substituting its choice for that of the jury and deciding between conflicting elements of the evidence, and should grant the motion only when it is convinced upon the record before the jury that reasonable persons could not have reached a verdict for the nonmoving party. 35 U.S.C.A. §§ 102, 103; Fed. Rules Civ. Proc. Rule 50(a, b), 28 U.S.C.A.

2. Federal Civil Procedure §2608

Party moving for judgment notwithstanding the verdict must show that either the jury's factual findings are not supported by substantial evidence, or, if they are, that those findings cannot support the legal conclusions which necessarily were drawn by the jury and forming its verdict. 35 U.S.C.A. §§ 102, 103; Fed. Rules Civ. Proc. Rule 50(a, b), 28 U.S.C.A.

3. Patents §36(2)

Presumption of validity afforded a patent requires that party challenging validity prove facts establishing invalidity by clear and convincing evidence. 35 U.S.C.A. § 282.

4. Patents §72(1)

A claim is anticipated only if each and every element as set forth in claim is found, either expressly or inherently described, in a single prior art reference. 35 U.S.C.A. § 102(e).

5. Patents §66(1.12)

Patent relating to a process for making urea-sulfuric acid liquid fertilizer by reacting water, urea, a nitrogen-containing chemical, and sulfuric acid, a sulfur-containing chemical, in particular proportions was anticipated by prior art reference disclosing processes for making both urea-phosphoric acid and urea-sulfuric acid fertilizers and was invalid. 35 U.S.C.A. §§ 102(e), 282.

6. Patents §72(1)

It was inappropriate for holder of patented fertilizer process to rely on fact that sulfuric acid was added slowly in prior art reference, whereas claimed process allowed for rapid addition, where there was no limitation in subject process with respect to rate at which sulfuric acid was added. 35 U.S.C.A. §§ 102(e), 282.

7. Patents §62(1)

Discarding testimony of experts with respect to what prior art reference taught did not eliminate reference itself as evidence or its uncontradicted disclosure that a base of recycled fertilizer in a process could be used to make more of the product and, hence, did not preclude conclusion that claimed process for making liquid fertilizer was invalid as anticipated by prior art. 35 U.S.C.A. §§ 102(e), 282.

8. Patents §72(1)

Failure of prior art reference to explicitly identify heel in process for manufacturing liquid fertilizer as a heat sink did not preclude reference from anticipating claimed process, thus requiring a finding of invalidity, where fact that heel functioned as a heat sink was inherent in prior art reference. 35 U.S.C.A. §§ 102(e), 282.

Andrew J. Belansky, Christie, Parker & Hale, Pasadena, Cal., argued for appel-

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lants. With him on the brief was David A. Dillard.

John P. Sutton, Limbach, Limbach & Sutton, San Francisco, Cal., argued for appellees. With him on the brief was Michael E. Dergosits.

Before MARKEY, Chief Judge, and DAVIS and NIES, Circuit Judges.

NIES, Circuit Judge.

Union Oil Company of California and Brea Agricultural Services, Inc. (collectively Union Oil) appeal from a judgment of the United States District Court for the Eastern District of California, No. CV-F-83-68 REC, entered on a jury verdict which declared U.S. Patent No. 4,810,343 ('343), owned by Verdegaal Brothers, Inc., "valid" and claims 1, 2, and 4 thereof infringed by Union Oil. Union Oil's motion for judgment notwithstanding the verdict (JNOV) was denied. We reverse.

I

BACKGROUND

The General Technology

The patent in suit relates to a process for making certain known urea-sulfuric acid liquid fertilizer products. These products are made by reacting water, urea (a nitrogen-containing chemical), and sulfuric acid (a sulfur-containing chemical) in particular proportions. The nomenclature commonly used by the fertilizer industry refers to these fertilizer products numerically according to the percentages by weight of four fertilizer constituents in the following order: nitrogen, phosphorous, potassium, and sulfur. Thus, for example, a fertilizer containing 28% nitrogen, no phosphorous or potassium, and 9% sulfur is expressed numerically as 28-0-0-9.

The Process of the '343 Patent

The process disclosed in the '343 patent involves the chemical reaction between urea and sulfuric acid, which is referred to as an exothermic reaction because it gives off heat. To prevent high temperature buildup, the reaction is conducted in the

presence of a nonreactive, nutritive heat sink which will absorb the heat of reaction. Specifically, a previously-made batch of liquid fertilizer—known as a "heel"—can serve as the heat sink to which more reactants are added. Claims 1 and 2 are representative:

1. In a process for making a concentrated liquid fertilizer by reacting sulfuric acid and urea, to form an end product, the improvement comprising:
 - a. providing a non-reactive, nutritive heat sink, capable of dissipating the heat of urea and sulfuric acid, in an amount at least 5% of the end product,
 - b. adding water to the heat sink in an amount not greater than 15% of the end product,
 - c. adding urea to the mixture in an amount of at least 50% of the total weight of the end product,
 - d. adding concentrated sulfuric acid in an amount equal to at least 10% of the total weight of the end product.
2. The process of claim 1 wherein the heat sink is recycled liquid fertilizer.

Procedural History

Verdegaal brought suit against Union Oil in the United States District Court for the Eastern District of California charging that certain processes employed by Union Oil for making liquid fertilizer products infringed all claims of its '343 patent. Union Oil defended on the grounds of non-infringement and patent invalidity under 35 U.S.C. §§ 102, 108. The action was tried before a jury which returned a verdict consisting of answers to five questions. Pertinent here are its answers that the '343 patent was "valid" over the prior art, and that certain of Union Oil's processes infringed claims 1, 2, and 4 of the patent. None were found to infringe claims 3 or 5. Based on the jury's verdict, the district court entered judgment in favor of Verdegaal.

Having unsuccessfully moved for a directed verdict under Fed.R.Civ.P. 50(a), Union Oil timely filed a motion under Rule 50(b) for JNOV seeking a judgment that the claims of the '343 patent were invalid

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under sections 102 and 103. The district court denied the motion without opinion.

II

ISSUE PRESENTED

Did the district court err in denying Union Oil's motion for JNOV with respect to the validity of claims 1, 2, and 4 of the '343 patent?

III

Standard of Review

[1] When considering a motion for JNOV a district court must: (1) consider all of the evidence; (2) in a light most favorable to the non-moving party; (3) drawing all reasonable inferences favorable to that party; (4) without determining credibility of the witnesses; and (5) without substituting its choice for that of the jury's in deciding between conflicting elements of the evidence. *Railroad Dynamics, Inc. v. A. Shiaki Co.*, 727 F.2d 1506, 1512-13, 220 USPQ 929, 936 (Fed.Cir.), *cert. denied*, 469 U.S. 871, 105 S.Ct. 220, 83 L.Ed.2d 150 (1984); *Connell v. Sears, Roebuck & Co.*, 722 F.2d 1542, 1546, 220 USPQ 193, 197 (Fed.Cir.1983). A district court should grant a motion for JNOV only when it is convinced upon the record before the jury that reasonable persons could not have reached a verdict for the nonmoving party. *Railroad Dynamics*, 727 F.2d at 1513, 220 USPQ at 936; *Connell*, 722 F.2d at 1546, 220 USPQ at 197.

[2] To reverse the district court's denial of the motion for JNOV, Union Oil must convince us that either the jury's factual findings are not supported by substantial evidence, or, if they are, that those findings cannot support the legal conclusions which necessarily were drawn by the jury in forming its verdict. See *Perkin-Elmer Corp. v. Computervision Corp.*, 732 F.2d 888, 893, 221 USPQ 669, 678 (Fed.Cir.), *cert. denied*, 469 U.S. 857, 105 S.Ct. 187, 83 L.Ed.2d 120 (1984); *Railroad Dynamics*, 727 F.2d at 1512, 220 USPQ at 936. Substantial evidence is more than just a mere

scintilla; it is such relevant evidence from the record taken as a whole as a reasonable mind might accept as adequate to support the finding under review. *Consolidated Edison Co. v. NLRB*, 305 U.S. 197, 229, 59 S.Ct. 206, 216, 83 L.Ed. 126 (1938); *Perkin-Elmer*, 732 F.2d at 893, 221 USPQ at 678; *SSIH Equip. S.A. v. U.S. Int'l Trade Comm'n.*, 718 F.2d 865, 371 n. 10, 218 USPQ 678, 684 n. 10 (Fed.Cir.1983). A trial court's denial of a motion for JNOV must stand unless the evidence is of such quality and weight that reasonable and fair-minded persons in the exercise of impartial judgment could not reasonably return the jury's verdict. *Envirotech Corp. v. Al George, Inc.*, 780 F.2d 763, 768, 221 USPQ 473, 477 (Fed.Cir.1984).

[3] Our precedent holds that the presumption of validity afforded a U.S. patent by 35 U.S.C. § 282 requires that the party challenging validity prove the facts establishing invalidity by clear and convincing evidence. *American Hoist & Derrick Co. v. Sowa & Sons, Inc.*, 725 F.2d 1350, 1360, 220 USPQ 768, 770 (Fed.Cir.), *cert. denied*, 469 U.S. 821, 105 S.Ct. 95, 83 L.Ed.2d 41 (1984). Thus, the precise question to be resolved in this case is whether Union Oil's evidence is so clear and convincing that reasonable jurors could only conclude that the claims in issue were invalid. See *Perkin-Elmer*, 732 F.2d at 893, 221 USPQ at 678; *Railroad Dynamics*, 727 F.2d at 1511, 220 USPQ at 935.

Anticipation

[4] A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. See, e.g., *Structural Rubber Prods. Co. v. Park Rubber Co.*, 749 F.2d 707, 715, 223 USPQ 1284, 1270 (Fed.Cir.1984); *Connell*, 722 F.2d at 1548, 220 USPQ at 198; *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 771, 218 USPQ 781, 789 (Fed.Cir.1983), *cert. denied*, 465 U.S. 1026, 104 S.Ct. 1284, 79 L.Ed.2d 687 (1984). Union Oil asserts that the subject claims of the '343 patent

are anticipated under 35 U.S.C. § 102(e)¹ by the teachings found in the original application for U.S. Patent No. 4,815,763 to Stoller, which the jury was instructed was prior art.

[6] From the jury's verdict of patent validity, we must presume that the jury concluded that Union Oil failed to prove by clear and convincing evidence that claims 1, 2, and 4 were anticipated by the Stoller patent. See *Perkin-Elmer*, 732 F.2d at 898, 221 USPQ at 678; *Railroad Dynamics*, 727 F.2d at 1516, 220 USPQ at 989. Under the instructions of this case, this conclusion could have been reached only if the jury found that the Stoller patent did not disclose each and every element of the claimed inventions. Having reviewed the evidence, we conclude that substantial evidence does not support the jury's verdict, and, therefore, Union Oil's motion for JNOV on the grounds that the claims were anticipated should have been granted.

The Stoller patent discloses processes for making both urea-phosphoric acid and urea-sulfuric acid fertilizers. Example 8 of Stoller specifically details a process for making 30-0-0-10 urea-sulfuric acid products. There is no dispute that Example 8 meets elements b, c, and d of claim 1, specifically the steps of adding water in an amount not greater than 15% of the product, urea in an amount of at least 50% of the product, and concentrated sulfuric acid in an amount of at least 10% of the product. Verdegaaal disputes that Stoller teaches element a, the step of claim 1 of "providing a non-reactive, nutritive heat sink." As set forth in claim 2, the heat sink is recycled fertilizer.²

The Stoller specification, beginning at column 7, line 80, discloses:

Once a batch of liquid product has been made, it can be used as a base for

further manufacture. This is done by placing the liquid in a stirred vessel of appropriate size, adding urea in sufficient quantity to double the size of the finished batch, adding any water required for the formulation, and slowly adding the sulfuric acid while stirring. Leaving a heel of liquid in the vessel permits further manufacture to be conducted in a stirred fluid mass.

This portion of the Stoller specification explicitly teaches that urea and sulfuric acid can be added to recycled fertilizer, i.e., a heel or base of previously-made product. Dr. Young, Union Oil's expert, so testified. Verdegaaal presented no evidence to the contrary.

[6] Verdegaaal first argues that Stoller does not anticipate because in Stoller's method sulfuric acid is added *slowly*, whereas the claimed process allows for rapid addition. However, there is no limitation in the subject claims with respect to the rate at which sulfuric acid is added, and, therefore, it is inappropriate for Verdegaaal to rely on that distinction. See *SSIH*, 718 F.2d at 378, 218 USPQ at 689. It must be assumed that slow addition would not change the claimed process in any respect including the function of the recycled material as a heat sink.

[7] Verdegaaal next argues that the testimony of Union Oil's experts with respect to what Stoller teaches could well have been discounted by the jury for bias. Dismissing that testimony does not eliminate the reference itself as evidence or its uncontradicted disclosure that a base of recycled fertilizer in a process may be used to make more of the product.

[8] Verdegaaal raises several variations of an argument, all of which focus on the

1. Section 102(e) provides:

A person shall be entitled to a patent unless—

(c) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs

(1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent....

2. Claim 4 is written in terms of approximate percentages of all reactants by weight of the end product. No argument is made that the process of claim 4 would result in a fertilizer product any different from that disclosed by Example 8 of Stoller.

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failure of Stoller to explicitly identify the heel in his process as a "heat sink." In essence, VerdegaaI maintains that because Stoller did not recognize the "inventive concept" that the heel functioned as a heat sink, Stoller's process cannot anticipate. This argument is wrong as a matter of fact and law. VerdegaaI's own expert, Dr. Bahme, admitted that Stoller discussed the problem of high temperature caused by the exothermic reaction, and that the heel could function as a heat sink.³ In any event, Union Oil's burden of proof was limited to establishing that Stoller disclosed the same process. It did not have the additional burden of proving that Stoller recognized the heat sink capabilities of using a heel. Even assuming Stoller did not recognize that the heel of his process functioned as a heat sink, that property was inherently possessed by the heel in his disclosed process, and, thus, his process anticipates the claimed invention. See *In re Oelrich*, 666 F.2d 578, 581, 212 USPQ 323, 328 (CCPA 1981); *In re Swinehart*, 439 F.2d 210, 212-13, 169 USPQ 226, 229 (CCPA 1971). The pertinent issues are whether Stoller discloses the process of adding urea and sulfuric acid to a previously-made batch of product, and whether that base would in fact act as a heat sink. On the entirety of the record, these issues could only be resolved in the affirmative.

On appeal VerdegaaI improperly attempts to attack the status of the Stoller patent as prior art, stating in its brief:

VerdegaaI also introduced evidence at trial that the Stoller patent is not prior art under 35 U.S.C. §§ 102(e)/103. Professor Chisum testified that the Stoller patent, in his opinion, was not prior art.... This conclusion finds support in

3. There is no dispute that the percentage of heel described in Stoller meets the percentage of heat sink required by the claims.

4. The jury instruction read:

Stoller filed two patent applications—an original application on October 30th, 1978, and a second on February 7th, 1980. Under the patent laws, the claims of the 343 patent are invalid if you find that the original application (Exhibit BL) anticipates the process claimed in the 343 patent.

In re Wertheim, 646 F.2d 527 (CCPA 1981), and 1 Chisum on Patents § 8.07[9]. Appellee Brief at 27 (record cite omitted). Seldom have we encountered such blatant distortion of the record. A question about the status of the Stoller disclosure as prior art did arise at trial. Union Oil asserted that, even though the Stoller patent issued after the '343 patent, Stoller was prior art under section 102(e) as of its filing date which was well before the filing date of VerdegaaI's application. Professor Chisum never testified that the Stoller patent was not prior art, but rather, stated that *he did not know* whether it was prior art. An excerpt from the pertinent testimony leaves no doubt on this point:

Q. (Mr. Sutton): And do you know whether the Stoller patent is prior art to the application of the VerdegaaI patent?

A. (Prof. Chisum): I don't know that it is, no.

We find it even more incredible that VerdegaaI would attempt to raise an issue with respect to the status of the Stoller patent given that the case was submitted to the jury with the instruction that the original Stoller patent application was prior art.⁴ VerdegaaI made no objection to that instruction below, and in its appeal briefs, the instruction is cavalierly ignored.

In sum, VerdegaaI is precluded from arguing that the Stoller patent should not be considered prior art. See Fed.R.Civ.P. 51; *Weinar v. Rollform Inc.*, 744 F.2d 797, 808, 223 USPQ 369, 375 (Fed.Cir.1984), *cert. denied*, 470 U.S. 1084, 105 S.Ct. 1844, 85 L.Ed.2d 143 (1985); *Bio-Rad Laboratories, Inc. v. Nicolet Instrument Corp.*, 739 F.2d 604, 615, 222 USPQ 654, 662 (Fed. Cir.), *cert. denied*, 469 U.S. 1038, 105 S.Ct. 516, 83 L.Ed.2d 405 (1984).⁵

5. Union Oil also argues that VerdegaaI's counsel misled the jury by its closing rebuttal argument: [B]ut I think it's important to keep in mind that [Stoller] couldn't have been a prior patent because it issued a month after the VerdegaaI patent had issued.

We disapprove of VerdegaaI's tactic which would form the basis for a grant of a motion for a new trial but for our conclusion that outright reversal of the ruling on the motion for JNOV is in order.

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After considering the record taken as a whole, we are convinced that Union Oil established anticipation of claims 1, 2, and 4 by clear and convincing evidence and that no reasonable juror could find otherwise. Consequently, the jury's verdict on validity is unsupported by substantial evidence and cannot stand. Thus, the district court's denial of Union Oil's motion for JNOV must be reversed.

Conclusion

Because the issues discussed above are dispositive of this case, we do not find it necessary to reach the other issues raised by Union Oil.⁶ In accordance with this opinion, we reverse the portion of the judgment entered on the jury verdict upholding claims 1, 2, and 4 of the '948 patent as valid under section 102(e) and infringed.

REVERSED.



Richard J. SIBSON, Appellee,

v.

The UNITED STATES, Appellant.

Appeal No. 86-1485.

United States Court of Appeals,
Federal Circuit.

March 17, 1987.

Air Force master sergeant was court-martialed and convicted of charges that he violated Air Force regulation by making personal commercial solicitations of lower-ranking enlisted members and violated a command directive by engaging in outside commercial activity for compensation without approval of his immediate commanders. After exhausting military remedies, ser-

6. It should not be inferred that all of these issues were properly before us. Union Oil appears to assume that on appeal it may dispute the resolution of any issue which is denom-

geant brought suit challenging the regulations. The United States District Court for the District of Arizona, Alfredo C. Marquez, J., 630 F.Supp. 1026, voided the court-martial, and Government appealed. The Court of Appeals, Davis, Circuit Judge, held that: (1) sergeant had proper notice that regulation prohibited group solicitations; (2) court-martial could permissibly find that sergeant also made one-on-one solicitations of lower ranking enlisted members; and (3) there was no violation of due process in applying directive to sergeant, even though directive was adopted after he became member of the military and began to engage in outside commercial activity, because sergeant should have known of directive, whether or not he had actual knowledge.

Reversed.

1. Constitutional Law §278.6(2)

Air Force master sergeant who was court-martialed and convicted on charge that he violated Air Force regulation by making personnel commercial solicitations of lower-ranking enlisted members had fair notice that regulation prohibited group solicitations by a superior as well as one-on-one solicitations, and thus his conviction is not in violation of his constitutional rights; moreover, court-martial could have permissibly found that sergeant also made one-on-one solicitations.

2. Armed Services §36

Constitutional Law §278.6(2)

It was not a violation of due process to apply Air Force command directive requiring approval of immediate commanders before engaging in gainful outside activity to Air Force master sergeant, even though directive was adopted after sergeant became a member of the military and began to engage in commercial activities, and there was no showing that he knew about directive; there was sufficient evidence to find that sergeant should have known of

inated an "issue of law" even though it was not raised in his motion for JNOV. This is incorrect. See *Railroad Dynamics*, 727 F.2d at 1511, 220 USPQ at 934.

RELATED PROCEEDINGS APPENDIX

None

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